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THE MICRO USER

Volume 1
Number 8
October 1983
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electron user

Vol. 1 No. 1 October 1983

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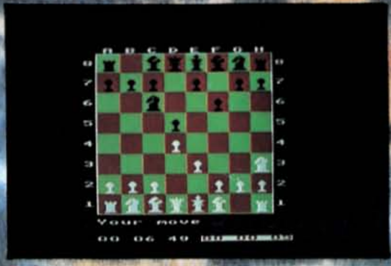

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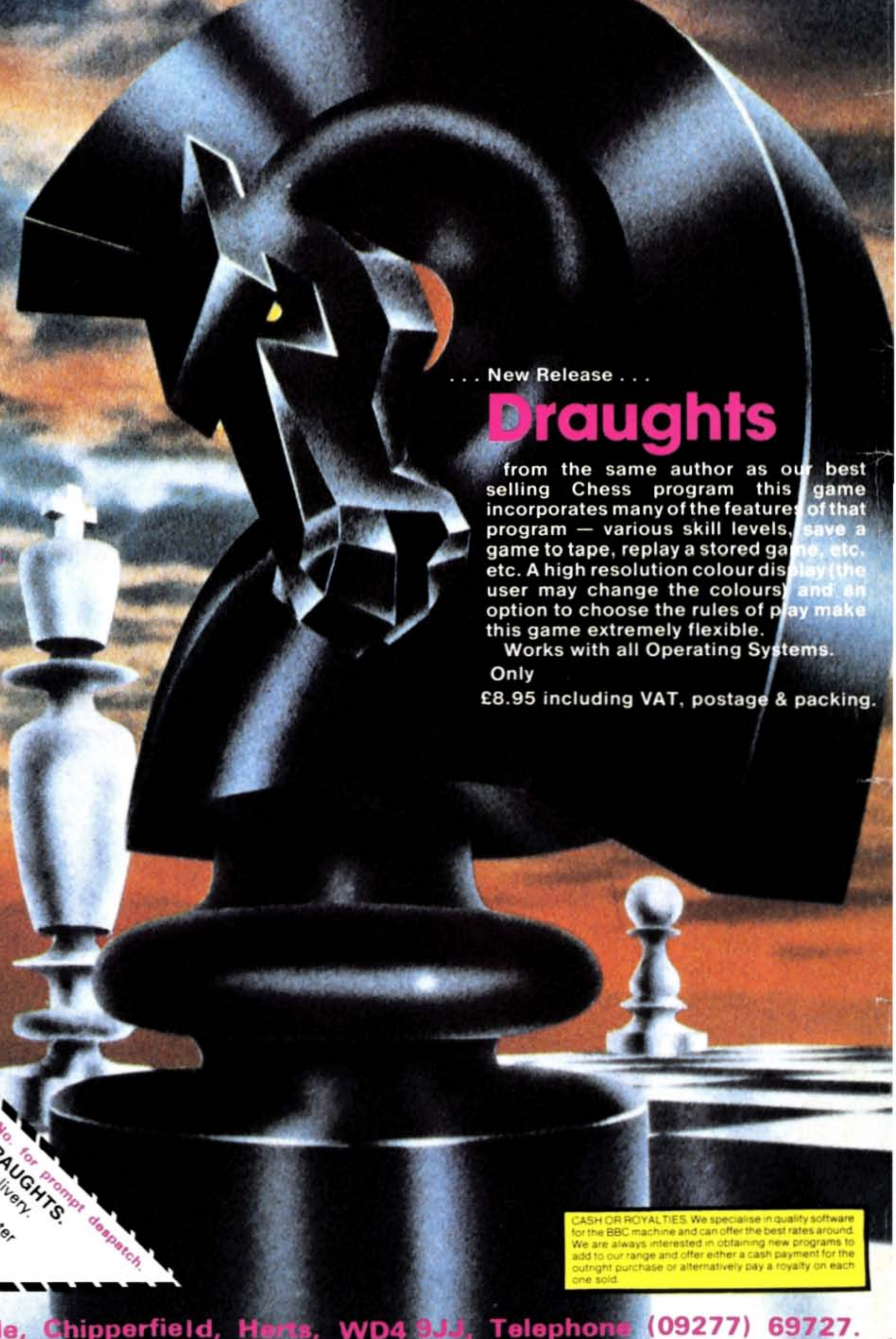

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Published by:
Database Publications Ltd,
Europa House, 68 Chester Road,
Hazel Grove, Stockport SK7 5NY.

Subscription rates for
12 issues, post free:

£12 – UK
£13 – Eire (IR £16)
£18 – Rest of world (surface)
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The Micro User welcomes program listings and articles for publication. Material should be typed or computer-printed, and preferably double-spaced. Program listings should be accompanied by cassette tape or disc. Please enclose a stamped, self-addressed envelope, otherwise the return of material cannot be guaranteed. Contributions accepted for publication will be on an all-rights basis.

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Distribution to the news trade in the UK and Ireland is by Wells Gardner, Darton and Co Ltd., Faygate, Horsham, West Sussex RH12 4SU (tel: Faygate 444). Enquiries regarding overseas distribution should be made direct to the publishers.

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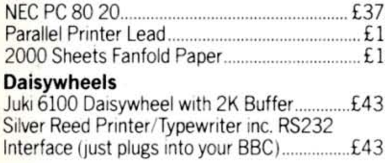
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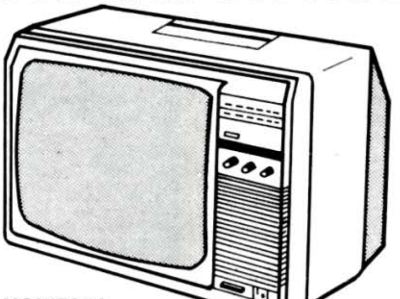

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There follows a list of all the commands in this ROM. These can be entered from the keyboard or can be combined into the user's program. They are also accessible from other language ROMs such as WORDWISE.

***DIS**

This is a very powerful disassembler. Special options allow 'offset' disassembly (which makes the disassembly appear to have come from another address), following of jumps and branches and skip calls to the MOS or BASIC. Output can be directed to file or the printer.

*** DISCTAPE**

This command will automatically transfer files, machine code and BASIC programs from a disc to tape.

*** DOWNLOAD**

Loads a file from tape or disc and moves it to any address. The normal address is &E00 allowing programs to be run on Disc systems without any loss of memory.

*** DSEARCH**

Will search the current disc for a string of characters or any sequence of bytes. The search starts from any track. When found the disc editing routine (DZAP) is entered.

***DZAP**

This is a disc editing routine that displays any sector of the disc. The cursor may be moved around the sector and new values can be entered in hex, decimal or binary or as ASCII text.

***EDIT**

Displays the contents of any function key for editing, so that long and complicated *KEY definitions do not have to be entered from scratch every time any alteration is needed.

***FIND**

Allows a BASIC program to be searched for any string, such as variable or procedure names, displaying all line numbers in which that string occurs.

***FORM**

Formats blank discs to any number of tracks. Options allow only specific tracks to be formatted. One special option will format discs that can have dual catalogues allowing 60 files per side of the disc.

***JOIN**

This will join one or more disc files together as one file. It may also be used for making copies of any file on the disc.

***MENU**

Typing *MENU or pressing M-BREAK will display a menu of all files on the disc saved under a special directory. Simply selecting one of the menu options will load and run the program.

***MOVE**

Moves a BASIC program from any page to any new page in memory. Amongst many other uses this allows programs on disc machines to be moved to &E00.

***MSEARCH**

Searches memory starting at the given address for any string or sequence of bytes. If the string is found, the area of memory is displayed with the memory editor (MZAP).

***MZAP**

Very much like the disc editor, this displays a window into memory. Once the cursor has been moved to the correct byte, new values may be entered in hex, decimal, binary or as ASCII characters. The window may be scrolled up or down through memory.

***PARTLOAD**

Allows any part of a file to be loaded into memory. This would allow a very large file to be split up into more manageable units.

*** RECOVER**

Any number of sectors can be loaded from the disc into memory with this command. Allows the recovery of any data from the disc such as deleted programs etc.

***RESTORE**

The opposite of the above command. Puts back directly onto the disc any section of memory.

***SHIFT**

Used to move any section of memory to any other address.

SWAP

This swaps catalogues on special dual catalogue discs, allowing up to 60 files per side of a disc — almost twice the normal.

***TAPEDISC**

The opposite of DISCTAPE, this will automatically transfer files from tape to disc.

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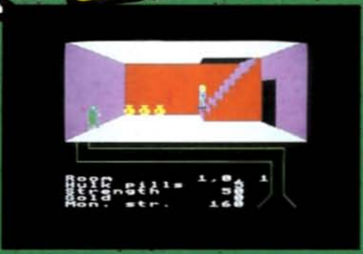

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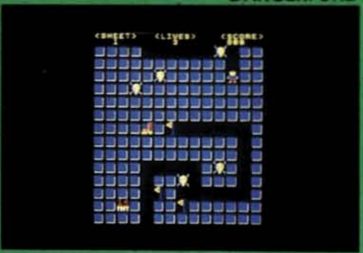

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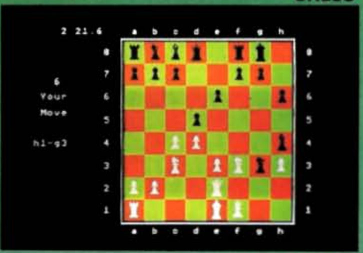

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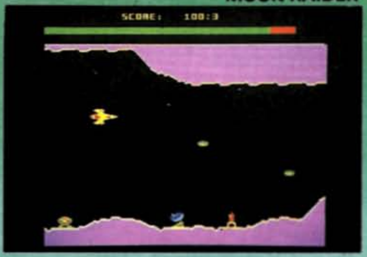

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As pilot of the highly manouverable Space Fighter you must try to penetrate the defences of the alien moon. Your craft is armed with a rapid-fire laser cannon and a large quantity of the latest Tryex bombs. Against you are self-firing rockets, nuclear Ack-Ack guns, spacemines, 'Fizzers' and meteors not to mention the network of narrow passageways that need to be negotiated. You have only limited fuel which must be replenished by either bombing the enemy fuel dumps or docking with the refuelling station. There are 6 phases to get through and 4 levels of difficulty. The game can be started at any phase and on any level. The controls are either from joysticks or from standard or user-defined keys. A game of the very highest standard.

DANGER! UXB £7.95

An explosive new, machine code release from Program Power. Based on the popular arcade game, the object of Danger UXB is to run and slide from bomb to bomb, defusing them as you go. Three levels of starting difficulty cater for all levels of player, each level being progressively harder. Every skill level has its own 'Hall of Fame' with scores ranked from poor to master. Excellent graphics and sound, along with great attention to detail (such as the Stomping Boots and Bonus points), make this a very addictive game.

CHESS (Model A £5.95 Model B £7.95)

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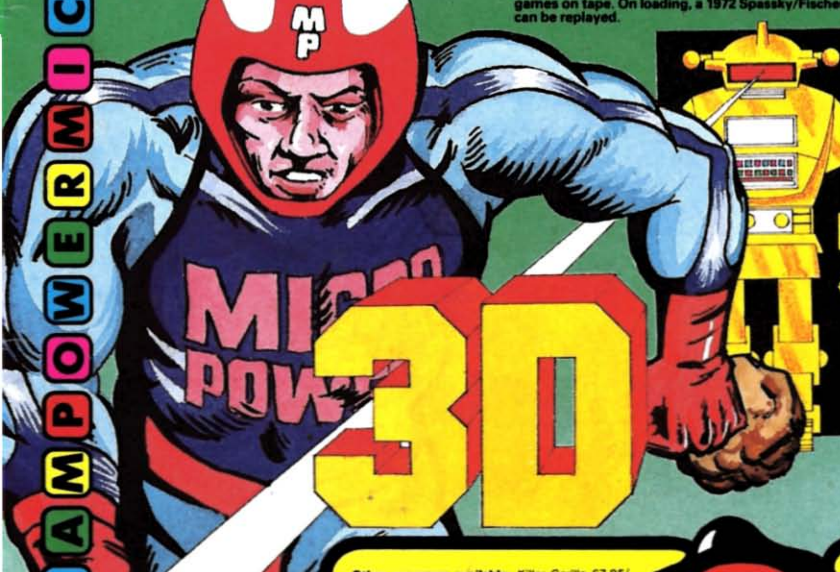

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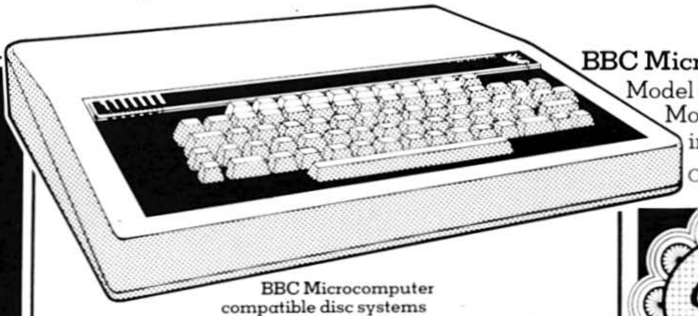

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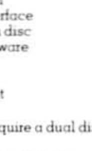

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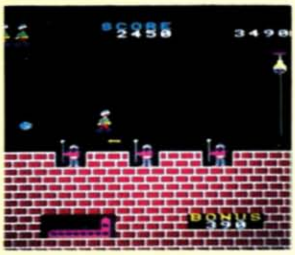
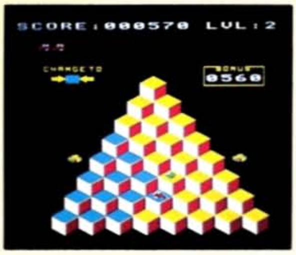


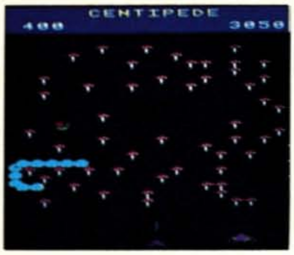
HUNCHBACK (32K) **£7·95**

An excellent version of the arcade game where Quasimodo attempts to rescue Esmeralda. Beautifully detailed animation (the best we've yet seen!) as Quasimodo leaps over the ramparts dodging rocks and arrows, swinging on ropes, avoiding the guards' spears, and ringing the bells. Twelve different screens of action, starting easy and becoming extremely difficult. Choice of starting speed and skill level. A programming masterpiece! (For use with KEYBOARD or JOYSTICKS).
●●● NEW RELEASE ●●●



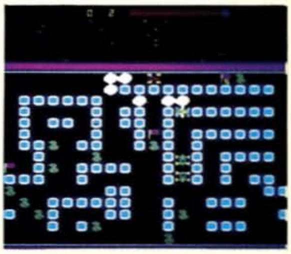
Q*BERT (32K) **£7·95**

A great new arcade game reaches the BBC micro. In this game, you have to move over a pyramid of blocks altering the colour of the blocks as you pass over them. Easy! Except that you have to avoid the balls, which tumble down towards you, and the pyramid's snake, which has a deadly sting. Transportation discs can be used to help you in your increasingly difficult task. Sound effects, hi-score, rankings, skill levels.
●●● NEW RELEASE ●●●



CENTIPEDE (32K) **£7·95**

Incredible arcade type game featuring mushrooms, snails, flies, spiders, and the centipedes of course. Excellent graphics and sound. 6 skill levels, hi-score, rankings, bonuses, and increasing difficulty as the spiders become more lively and the number of mushrooms increases.
(For use with KEYBOARD or JOYSTICKS).
"Visually this game compares well with the arcade version, being colourful and clear."
... YOUR COMPUTER



ROAD RUNNER (32K) **£7·95**

The only full feature machine-code version of the arcade game available for the BBC micro. Features include: scrolling screen, radar display, checkpoint flags, fuel gauge, smoke screens, 6 skill levels, rankings, increasing difficulty, and sound effects.
(For use with KEYBOARD or JOYSTICKS).
"The game becomes very hard and has very smooth graphics. Excellent."
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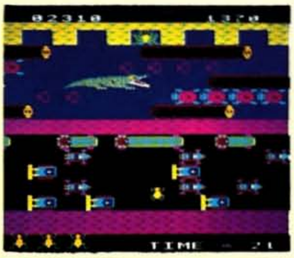
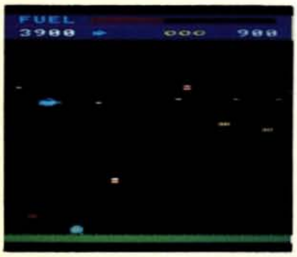


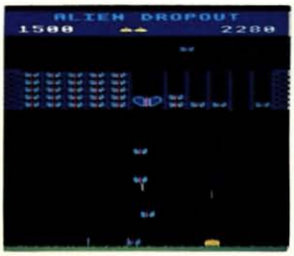
FROGGER (32K) **£7·95**

Not just another version of Frogger ... this is the arcade-quality version that you've been waiting to see. Graphically brilliant with gaping-mouthed crocodiles, diving turtles, flies, and frogs that flex their legs as they jump along. Increasing difficulty, and responsive controls.
(For use with KEYBOARD or JOYSTICKS).
"... very good indeed ... fast flicker-free graphics and a frog that really hops!"
... BEEBUG MAGAZINE



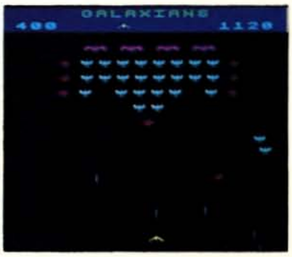
SPACE FIGHTER (32K) **£7·95**

Arcade-style game based upon features from DEFENDER and SCRAMBLE. 5 types of menacing alien fire at you and may attempt to ram you. Separate attack phases, fuel dumps, repeating laser cannon, asteroids, smart bombs, hi-score, rankings, 6 skill levels, sound effects.
"A thoroughly enjoyable program, well worth the money ... " ... HOME COMPUTING WEEKLY



ALIEN DROPOUT (32K) **£7·95**

Based upon the arcade game of ZYGON, but our version improves upon the original arcade game itself. You have to shoot the aliens out of their "boxes" before the "boxes" fill up. Once full, the aliens fly down relentlessly, exploding as they hit the ground.
(For use with KEYBOARD or JOYSTICKS).
"... these moths are out to get more than the clothes in your wardrobe" ... YOUR COMPUTER



GALAXIANS (32K) **£7·95**

Fast action version of the popular arcade game. 4 types of Galaxian (in 3 initial screen formations) swoop down individually or in groups of two or three. 6 skill levels, hi-score, rankings, bonus laser bases and increasing difficulty. Superb sound effects and graphics.
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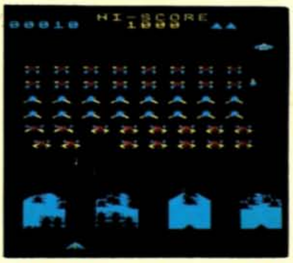

INVADERS (32K) **£7·95**

Superb version of the old classic arcade game, with novel enhancements. 48 marching invaders drop bombs that erode your defences, and two types of spaceship fly over releasing large bombs that penetrate through your defences. Increasing difficulty, hi-score, superb graphics and sound.
(For use with KEYBOARD or JOYSTICKS).
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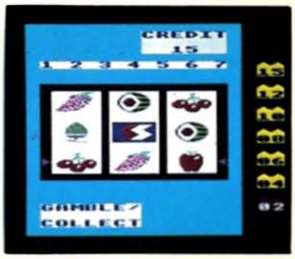

FRUIT MACHINE (32K) **£7·95**

Probably the best fruit machine implementation on the market. This program has it all ... HOLD, NUDGE, GAMBLE, spinning reels, realistic fruits and sound effects.
"The graphics are very good ..."
... YOUR COMPUTER

COLDITZ ADVENTURE (32K) **£7·95**

Can you escape from Colditz with everything you need to get home? Graphics are used at important stages in the game, and a haunting tune plays as you start the quest. A challenging adventure requiring careful logical thought to make your escape.
●●● NEW RELEASE ●●●

CRIBBAGE (32K) **£6·95**

An impressive version of the card game of cribbage. Play against the computer, and see the scores being pegged onto the cribbage board. Very good graphics, and the computer plays extremely well. Full verification at all stages of play.
●●● NEW RELEASE ●●●

PONTOON (32K) **£6·95**

Up to 6 players can play against the computer as banker, or you can play individually against the computer, with alternating banker. Very good graphics, and the game features all standard rules, including "splitting pairs".
●●● NEW RELEASE ●●●

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THE MICRO USER NEWS

October 1983

Sprite boosts Basic speed

AT last everyone can write fast-moving, all-action games for the BBC Micro in Basic!

That's the claim of software house DACC. Their latest product, Sprite-Gen, allows you to control up to 32 multi-coloured "sprites" – creatures rather like user defined characters – and animate them in a manner previously only found in machine code games.

The software comes complete with documentation, including full listings of the two free games programs on tape, which illustrate the way Sprite-Gen can be included in users' own programs.

In a unique move in the software field, DACC have granted permission for other software houses to incorporate Sprite-Gen routines into their programs, provided they are informed, and the use acknowledged.

W H Smith takes Electron on trust

A MAJOR retail chain has gone against traditional market trends by starting to sell a microcomputer from day one of its launch.

No waiting period to see how it sells

W.H. Smith gave the green light for more than 100 of its "Computer Know-How" departments in branches throughout the UK to start sales of the Electron from Day One.

It is believed that this is the first time a high street network has taken such action.

Until now leading retail organisations have delayed stocking micro products until market acceptance has been confirmed.

This comes just two months after W.H. Smith's decision to distribute the BBC Micro.

"We are very excited to be the only multiple retailer selling the new Electron", says Stewart Binnie, the merchandise controller of the group's computer section.

"It is a mark of our confidence in the new machine that we are happy to be involved from the first day of its appearance".

Iceland opts for Beebs

THE BBC Micro has even reached Iceland. It's been officially adopted by the Icelandic Ministry of Education as the computer that schools should have – in its English version – as it is considered that English is the universal language of computing.

The chip that spills the beans . .

AN eprom to deter would-be BBC Micro thieves has been developed by Software Services.

On power-up, the chip causes the name, address and telephone number of the computer to be displayed on the screen along with the machine's serial number.

Code

To enter Basic you have to type in an identity code, from which point the machine functions normally.

An additional feature – ideal for those wishing to preserve their work from the depredations of colleagues – is a temporary software lockout. Once activated, the program cannot be accessed until the user code has been entered.

Minister for Information Technology Kenneth Baker at the Concerned Technology Exhibition

NOW BBC MICRO AIDS DISABLED

THE BBC Micro is playing a leading role in a travelling exhibition designed to show how the latest technology can benefit the disabled.

The show has just begun a 27-stop nationwide tour.

Known as "Concerned Technology", it is being funded by the Department of Trade and Industry to help encourage the development of information technology aids for those with special needs.

Opened in Hastings last month, the exhibition is scheduled eventually to wind up in Inverness in July of next year.

Manned by the disabled – who will also receive on-site training – it will display a wide range of electronic aids.

Each venue has catered specifically for the needs of the disabled, and the exhibition is free.

Opening times at all the locations will be from 10am to 6pm on Fridays and Saturdays and 10am to 4pm on Sundays.

During October, "Concerned Technology" will be in Exeter (October 1-2), Plymouth (7-9), London (12-14), Newquay (21-23) and Milton Keynes (28-30).

EDUCATION CHANGE-OVER AT ACORN

JOHN Coll, perhaps best known among BBC Micro owners as the author of the User Guide, has left Acorn.

Previously manager of Education Services there, he has taken up a post at the Microelectronics in Education project.

This is ironic as his successor, Maurice Edmundson, an HMI with the Department of Education, has been working closely with the MEP project for the past three years.

Respect

He told *Micro User*, "John and myself have been associated for some time in our respective roles. I have great respect both for himself and the work he did at Acorn.

"I won't be taking on all of his responsibilities, such as the software and the hardware. John will be helping us out with these over the next three months as a freelance lecturer.

"I'm not a second John Coll. I'm Maurice Edmundson and I'll be dealing directly with the school side of things".

With 40 years of experience as teacher, headmaster and then HMI, Maurice certainly brings a great deal of experience to the job. But isn't it all very different from the Department of Education?

Said Maurice, "It's more demanding than I expected, but it really is very exciting".

77
ACORN COMPUTER
Marlboro F3
ACORN COMPUTER
ACORN COMPUTER

David Hunt with his Acorn-sponsored Ralt RT3

User Guide updated

LATEST book on the market for the BBC Micro is the "Advanced User Guide".

Published by the Cambridge Microcomputer Centre, it is not an official Acorn product, although the authors did get a great deal of co-operation from Acorn.

The 512-page volume supplements the original User Guide, covering both software and hardware.

Details

Included are full details of the assembler, the operating system workspace, paged ROMs, the OSBYTE calls, the 1mHz bus – and almost everything else that wasn't in the original guide.

The book is already causing a huge amount of interest – not least at Acorn, who have ordered 200 copies themselves.

ROM 'teething problems'

A CARDIFF company has admitted that it is having "minor teething problems" with the new ROM board it recently launched on the market.

However, Sir Computers has no plans to withdraw the 120 units it has already sold or to stop selling before the necessary modifications have been made.

"The board itself is working perfectly but the problem lies in the supports", says Paul Kathro of Sir's research and development team.

"At the present time, it is resting on its power connectors but we intend to rectify this shortly by introducing a plastic leg".

The extension circuit board has been designed to fit into the BBC case and is capable of holding 12 extra ROM chips. When used in conjunction with the four existing sockets, this provides 256k of memory sideways-paged in blocks of 16k.

To date, only five customers have complained about the problem with the supports and have been offered their money back or promised the modified board as soon as it becomes available.

"We see this as only a minor teething problem", says a company spokesman.

Upgrade doubles memory

A NEW double density disc controller for the BBC Micro has been launched by Microware.

The present controller permits only single density operation. With the new system, a disc which previously held a maximum of 100k will now hold up to 204k.

Additional features include up to 1,500 files on each disc, file names of eight characters plus three characters suffix, 40/80 track switching and a variety of possible disc formats to allow for compatibility with future systems.

Compatible

The system is also claimed to be 100 per cent compatible with the Acorn DFS, using the same memory locations as workspace.

The upgrade requires the new DFS to be in the sideways ROM socket, plus a piggy-back board, containing three PALS and the new controller, that plugs into the old 8271's socket.

If you have a DFS already, the upgrade costs £79, otherwise it is £99.

★ ★ ★

SALES of the BBC Micro continue to boom. More than 140,000 have been produced and it now represents the majority of micros in schools.

Not what it seems

A NEW software company has come up with what it feels is an appealing package for BBC Micros under a most unattractive name – AIDS.

Fortunately, what SoftSmith of Hersham is offering is not the killer disease, Auto Immune Disease Syndrome, at present striking fear into the hearts of residents of leading American cities.

AIDS – the software variety – is supplied on a single 4k eprom which can be fitted in 10 minutes to any BBC Micro model A or B, providing it has MOS release 1.0 or greater.

"I realise now that the name will cause a few eyebrows to be raised", admits Brian Smith, the proprietor of SoftSmith.

"But there are a lot of daft names around in the software business at the moment so I don't suppose it matters all that much.

"Let's just hope it catches on – our type of AIDS, that is".

Micros enter Formula Three racing

ACORN Computers have branched out into the world of motor racing.

Not to be outdone by Clive Sinclair's electric car, they will be sponsoring a Formula Three car throughout the next racing season at a cost of £90,000.

Driving the Acorn car will be 23-year-old David Hunt, brother of ex-world champion James Hunt.

Already a success on the motor racing circuit, this year sees his entry into the more demanding and expensive world of Formula Three racing. Acorn's sponsorship comes at just the right time.

With the car appearing in Acorn livery, the venture has all the hallmarks of a well-planned marketing campaign. Acorn boss Chris Curry, however, points out that one of the chief reasons for the sponsorship was to provide an "exciting diversion" for Acorn staff.

Also, the car's appearance on the racing tracks of the country fits in well with Acorn's policy of regionalisation.

Acorn aren't just pouring money into the venture. They intend to use their computer expertise to devise a general computer model of Europe's race tracks that will enable the car to be set up optimally for each event.

Promising

So far, David Hunt has had one outing at Silverstone which, while not being a winning performance, was certainly promising.

If you want to see David and the Acorn car in action, you'll be able to catch them at Donnington on October 8-9 and at Thruxton on October 23 and November 12.

New look centre for BBC Micro User Show

THE BBC Micro User Show in December will be one of the first major events to be held in the world famous Westminster Exhibition Centre in London following a £500,000 refurbishment programme that is now under way.

Fifty tradesmen are currently on site working against the clock to complete the facelift.

Originally built for the Royal Horticultural Society in 1904 to hold flower shows – and still owned by that organisation – the roof had begun to leak and the brick skin deteriorate.

The roof has now been completed replaced, the walls repaired and now extensive interior work is being undertaken.

In the 20,000 sq ft main hall, which is to house the BBC Micro User Show from December 8 to 11, some 16 miles of scaffolding tube and six miles of board were needed to carry out the necessary repairs.

SHARING ADD-ONS

BUSINESS as well as educational users often want more micros but fewer peripherals.

A manual switch box, developed by Softronics, is being marketed as a solution of the problem.

The 3-20 switch links two or three computers.

BASIC II ROM IS COMING

GOOD news for all those who want to upgrade their micros to Basic II. Acornsoft are shortly to release the Basic II ROM.

The price of £15 must represent good value for any language, particularly as full documentation is included.

Getting programming taped

NEWCOMERS to the BBC Micro now have two new ways of learning to program the machine.

Micromode have devised a "correspondence course with a difference". Not only are students able to monitor their own progress with the aid of self-tests but they also have access to a tutor via a special "hot line" telephone number.

Micromode feel that this interactive element is vital if true learning is to take place.

Features

The 10-module course, costing £18, is designed to make full use of BBC Basic's special features and to encourage structured programming.

Alternatively, programming novices can learn programming from the Master Class video training cassettes. Three titles are devoted to the BBC Micro: Starting to Learn Basic, Further Basic and the BBC Micro in Primary Education.

The tapes, lasting about an hour, are intended to give a thorough grounding in the use of the BBC Micro. There is also a video ready on the Electron.

The tapes, costing £19.95, will be on display at the BBC Micro User Show in London in December.

Microwriter link with the Beeb

A KEYBOARD claimed to allow you to be touch-typing within an hour has just been interfaced to the BBC Micro.

The hand-shaped, six key Microwriter keyboard is said to be far simpler and more natural to use than the standard typewriter keyboard.

The BBC Micro has been chosen because of its widespread use in Britain's schools.

Said a Microwriter spokesman: "People are completely conditioned to the QWERTY keyboard, and the reconditioning has to be started with children. Given a choice, children pick the Microwriter.

"With the new keyboard they can write two to three times faster than their own handwriting. Any child can produce neat, well presented work".

Up to four keyboards may be interfaced to the micro at one time, sharing a split screen when necessary.

The basic interface unit, with one keyboard, adaptor and software, sells for £39.50, additional keyboards costing £15.75. Games and educational software are also available.

PRESENT HELPS WIN A HONG KONG HOLIDAY

A CHRISTMAS present from his wife has led to David Hubbard of Welwyn Garden City winning the £3,500 holiday of a lifetime for two in exotic Hong Kong.

Kathryn Hubbard gave her husband a BBC Micro last Christmas which enabled him to enter the *Micro User* contest to design a chess board.

But although she provided the key to scooping the star prize, she won't be going along on the dream trip. The couple have three small children – Helen, aged nine months, Louisa, five, and Alice, eight – who will keep her at home.

Instead, David Hubbard will be taking along his 70-year-old father Leslie, a retired horticulturalist, to sample the delights of the Far East.

"We talked about the possibility of winning when I entered – although we didn't hold out much hope – and that's what we had decided", he told *Micro User*.

The computer controller at British Shipbuilders in St Albans, David Hubbard was left almost speechless when told of his good fortune.

His winning entry was selected from more than 500 received for the contest which offered the most fabulous prize ever offered by *Micro User*.

Now, David and his father will be flown by Cathay Pacific from London to Hong Kong where they will spend five nights as guests at one of the most luxurious hotels in the Far East, the famed Sheraton.

A highlight of the trip will be an escorted tour of the bustling Wong factory in Kowloon from where thousands of BBC Micros flood out to service the world market.

It took the contest winner 50 hours, working mainly after his family had gone to bed, to come up with the winning entry.

Not that David Hubbard is a stranger to the world of computers. After teaching himself the basics for a number of years, he signed on for a part-time course at Hatfield Polytechnic in 1978, emerging with an MSc in computer science last year.

Acorn in top five

FIVE years after its formation, Acorn Computers turnover has reached £42 million, placing it in the top five UK computer companies along with ICL, Ferranti, Systime and Sinclair.

The company's staff will grow to 400 by mid-1984.

BARRY WOOD'S TAILPIECE

SORRY about the non-appearance of my column last month. (The rumour I'd been taken prisoner by Acorn was untrue.)

I did actually write my column, then saved it onto disc. The trouble was that I was using one of the new DFS chips and it took so long I missed the deadline.

★ ★ ★

IT appears that Acornsoft are going into the business of marketing and distributing other companies' software for them.

Given the difficulties getting their own products out of them, it seems to me like a case of the blind leading the blind.

★ ★ ★

WHAT with this upstart beast the Electron being so wonderful, we can confidently expect that demand will outstrip supply. No doubt some enterprising software house will soon be selling a program to turn BBC Micros into Electron emulators.

★ ★ ★

I HEAR that *The Micro User* was going to print an error trapping program which, when run, would make it impossible for people to make an error when typing in a listing.

They abandoned the idea when they realised that it was so complex that no one would be able to type it in without making a mistake . . .

★ ★ ★

IT'S amazing what you can discover at computer shows. My last visit to one led me to discover Woods' Law which states:

The length of the skirt worn by the girls at any stall is directly proportional to the quality of the software they're selling.

★ ★ ★

IN an effort to prove just how versatile the BBC Micro is, I wrote a series of articles for *The Micro User* but our editor threw them out.

Is there another editor out there interested in publishing my "Hands-on Approach to Computer Fraud"?

★ ★ ★

SO Acorn are sponsoring a racing car are they? Rumour has it that next year they're bringing out a slightly cheaper version. The pedals are arranged differently – and it goes at half the speed.

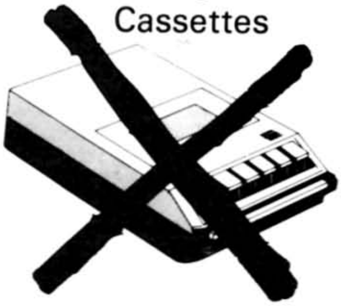
Actually, it's quite a good idea to have a racing car. The name Acorn emblazoned on it will probably appear on all the TV screens of the country.

Good luck David. Let's hope you're one of Acorn's 1.2s, not a 0.1.

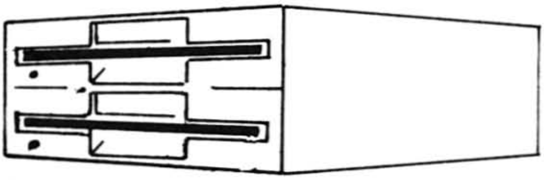
★ ★ ★

I'VE been told that Acorn are going public soon. I think I'll invest some of my hard earned pennies. See you at the shareholders meeting, fellows!

Forget
Cassettes



REMEMBER
Disc Drives



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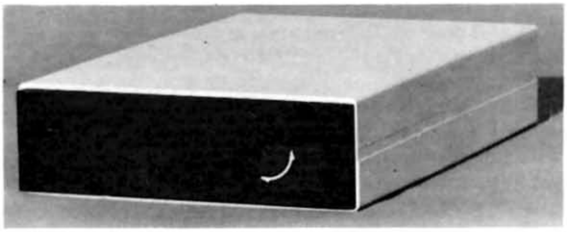

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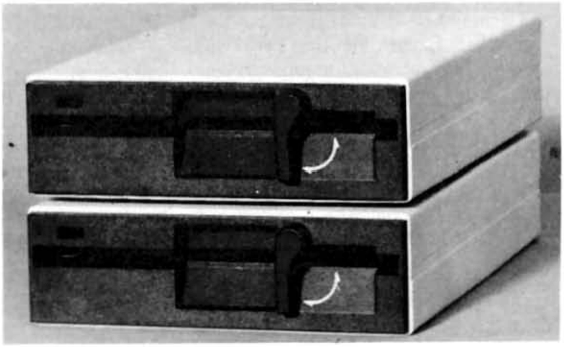

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Part seven of MIKE BIBBY'S introduction to programming

We've tried REPEAT . . . UNTIL and GOTO, so now go . . .

LAST time we looked at two types of loops – REPEAT . . . UNTIL loops and an alternative that used a conditional statement and a GOTO.

However, if you just want your micro to do something a fixed number of times, there is another kind you can use, the FOR . . . NEXT loop.

If you have a number of lines of a program that you want repeating, you mark them out by putting the FOR statement at the beginning and the NEXT statement at the end of those lines.

When the BBC Micro reaches a FOR it knows it has a loop on its hands. It will repeat the lines (or code, as the professionals say) between the FOR and the NEXT as many times as needed.

To do this, the micro needs to use a variable as a counter to keep track of how often the loop has been performed.

In our previous loops we've always used a numeric variable for our counter – *number*. Each time the loop was performed we increased *number* by one until we reached our finishing condition.

In a FOR . . . NEXT loop the variable you use for your counter increases automatically on each repetition of the loop. However, you need to tell the micro where to start and where to finish.

To see how we do this in practice, let's look at Program I, which prints out HELLO 10 times.

```
10 REM  Program I
20 MODE 6
30 FOR number=1 TO 10
40 PRINT"HELLO"
50 NEXT number
60 PRINT"GOODBYE"
```

Progam I

Lines 30 and 50 mark out the lines we want repeating (line 40). Line 30 reads:

```
30 FOR number=1 TO 10
```

The FOR indicates the beginning of the loop. This is followed directly by the counter variable, in this case number. After the '=' sign the 1 to 10 tells the micro to start *number* at 1 and keep on increasing it by one each time the loop is repeated until you get past 10.

The loop is then finished and the micro carries on with the rest of the program, in this case line 60.

The outcome of all this is that HELLO is printed 10 times followed by a final GOODBYE.

The micro's thought processes go like this:

number=1. Print "HELLO".
Increase number.
number=2. Print "HELLO".
Increase number.
number=3. Print "HELLO".
Increase number.

and so on until

number=9. Print "HELLO".
Increase number.
number=10. Print "HELLO".
Increase number.
number=11. But the loop is TO 10.
So go on to line 60.

Let's learn some jargon:

- *What we've called the counter is, not surprisingly, called the loop variable.*
- *The "limits" of the loop – in this case 1 and 10 – are called the loop parameters.*
- *The lines of the code to be repeated are termed the body of the loop.*
- *When you finish a loop and continue with the rest of the program we say that you have dropped out of the bottom of the loop.*

Notice that we've put the loop variable, *number*, after NEXT in line 60. This isn't strictly necessary (try leaving it out), but if I were you I'd get into the habit of putting loop parameters after NEXT – they make your program far more readable.

All the above has been a rather long-winded explanation of a simple method of getting the computer to do something a fixed number of times.

Try the following versions of line 30, and keep a careful count of the number of HELLOs you obtain. Are they what you expected?

```
30 FOR number=1 TO 20
30 FOR number=10 TO 20
30 FOR number=11 TO 20
30 FOR number=11 TO 20
30 FOR number= 0 TO 11
```

Just to warn you of a possible source of future errors, try changing line 30 to

```
30 FOR counter=0 TO 11
```

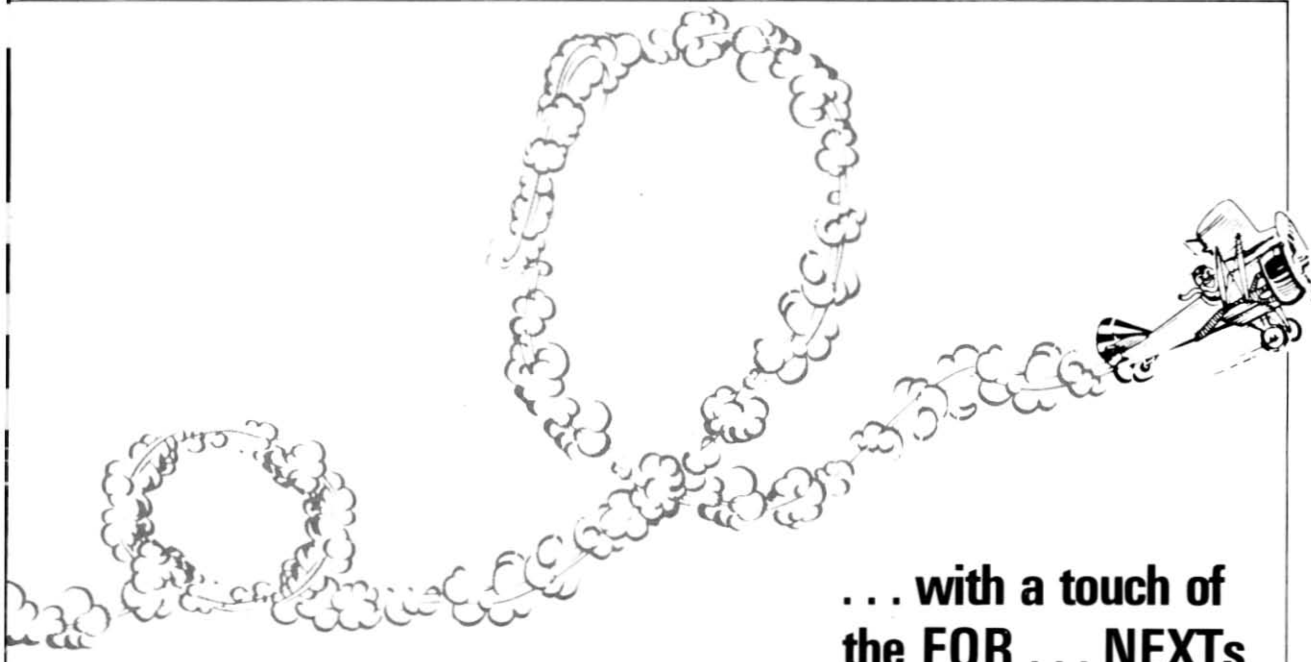
Assuming that you haven't changed line 50 from the original Program I, you'll get a syntax error message. This is because the loop variable you've specified in the FOR statement *(counter)* doesn't match the one after the NEXT *(number)*.

Before we leave Program I, try altering lines 30 and 50 to read:

```
30 FOR number%=1 TO 10
50 NEXT number%
```

If you run it you'll find it works perfectly with this change of loop variable. However, we aren't just dealing with another character (%) tagged onto the end of a numeric variable – we're using a completely different type of variable, an integer variable.

Integer variables are similar to numeric variables in the sense that they



. . . with a touch of the FOR . . . NEXTs

label numbers and we can do sums with them. However, they only deal with whole numbers, not decimals – "integer" means "whole number".

Just as we used $ on the end of our label to show that we were using string variables, so we use % on the end of our label to indicate numeric variables.

Now try Program II:

```
10 REM ***PROGRAM II***
20 MODE 6
30 number=5
40 number%=6
50 PRINT"number is ":number
60 PRINT"number% is":number%
70 PRINT"number%/2 is ":number%/2
80 number=7.5
90 number%=7.5
100 PRINT"number is now ":number
110 PRINT"number% is now "number%
```

Program II

In lines 30 and 40 we assign different values to *number* and *number%*. Lines 50 and 60 then print these out, proving that the computer does indeed consider them to be entirely different variables.

Line 70 demonstrates that we can do sums with integer variables, in this case a division.

In lines 80 and 90 we try to assign the value 7.5 to each of our variables. But, as I mentioned above, you can't do this with integer variables, you need numeric variables for handling decimals.

However, the BBC Micro does not throw line 90 out. It simply turns 7.5 into an integer by ignoring the numbers after the decimal point! In other words, *number%* takes the value 7.

This rather unsubtle approach of ignoring the figures after the decimal point is known as taking the integer part.

(Notice that this isn't the same as the "rounding up" or "rounding down" that you may have learnt at school. The BBC Micro simply turns a blind eye to whatever is after the point and deals with the whole number.)

So why use integer variables instead of numeric, which do sums and are capable of dealing with decimals?

The reason is that the integer variables are far easier to handle, so programs with them in run much faster. Also they take up less of the computer's memory than numeric variables. Use them!

Let's return to loops now. Try Program III:

```
10 REM ***Program III***
20 MODE 6
30 FOR loop%=1 TO 10
40 PRINT loop%
50 NEXT loop%
```

Program III

If you recall, the loop parameter increases by one each time the loop is repeated. In a burst of wild originality I've called the loop parameter *loop%*.

The first time through the loop, *loop%* is 1, so line 40 prints out the value 1. Then *loop%* is increased to 2 since it is the counter, so line 40 prints out 2, and so on.

Once you've worked out what is happening here try adding:

```
60 PRINT loop%
```

The new line prints out the value of *loop%* after the loop has ended. Can you explain the result?

```
10 REM ***Program IV***
20 MODE 6
30 FOR loop%=1 TO 10
40 PRINT loop%,loop% * loop%, loop% *
loop% * loop% 50 NEXT loop%
```

Program IV

Program IV prints out the squares and cubes of the numbers up to 10. Rather nice isn't it?

Of course, there's no need for you to stop at 10 – try increasing it to 100. That's the good thing about loops – you can get the micro to do a considerable amount with very little coding on your part.

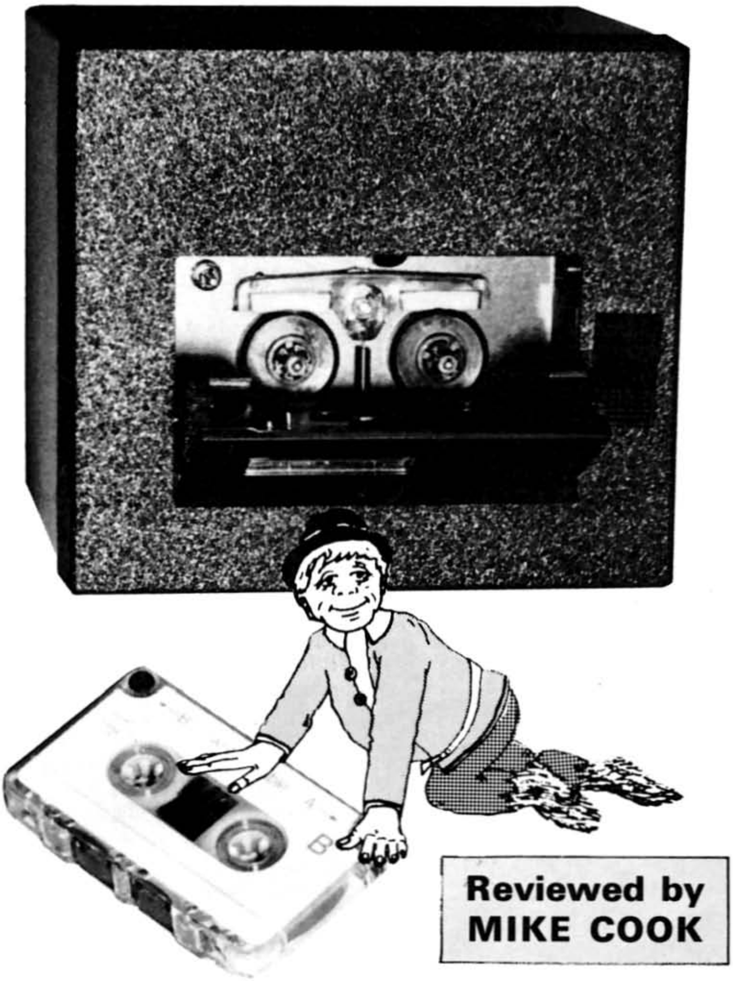
Program V will print out whatever multiplication table you want.

```
10 REM ***PROGRAM V***
20 MODE 6
30 INPUT  "Which table do you want",
number%
40 FOR loop%=1 TO 12
50 PRINT;loop% " multiplied by ":
number% " is "; loop% * number%
60 NEXT loop%
```

Program V

Finally, can you alter line 40 of Program III so that the output starts with a 10 and decreases to 1?

Is it a tape? Is it a disc?



Reviewed by MIKE COOK

No! It's a HOBBIT

WHILE in the world of Tolkien a Hobbit is a small halfling with furry feet that lives down holes, in the world of computing a Hobbit is a halfling that copes without the furry appendages, falling somewhere between a tape and a disc mass storage system.

The Hobbit uses data cassettes of the size used in dictation machines. However they are filled with certified data quality tape.

But as the computer can control the forward and reverse winding of the tape it behaves more like a disc drive.

Both sides of the tape can be used, giving a total storage of 104k for one tape.

In appearance the Hobbit is deceptively simple, being a small box 3.5in x 3.5in x 4in. The only control is a lever to eject the tape cassette.

It comes with ribbon cable for connection to the user port and wire for connection to the auxiliary power supply connector on the BBC Micro.

Its exterior matches the BBC Micro, and it sits neatly on the top of it.

Also included is the Hobbit ROM, which needs to be installed in a specific socket. On my machine the Basic ROM occupied this position and so this had to be moved down a socket.

On powering up you are informed that the Hobbit filing system is installed. You can at any time switch back to the normal tape system with a *TAPE command.

Just like a disc, a Hobbit tape has to be formatted before it can be used. This is the writing of data onto the tape which will act as block headers or compartments in which data can be stored.

Also the directory needs to be initialised to keep tabs of which blocks belong to each program.

This procedure took just over four minutes to complete involving much winding and rewinding of the tape.

If it seems like a long time, remember it will only have to be done once for each of your tapes.

I then set about transferring some programs from the normal tape system into the Hobbit. First was Deathwatch (March 1983 *Micro User*) which took 1 min 35 seconds to load from conventional tape and took the Hobbit 50 seconds to save. When I got the Hobbit to load it back however it only took 20 seconds.

The Hobbit has a *CAT command just like the disc or tape filing system, but it is more sophisticated.

As well as "the volume" and a list of all the files stored, you are told how many blocks they take up on the tape as well as the type of file.

In this case "the volume" is nothing to do with loudness but is the name given to the tape during formatting.

Each file in the catalogue (which has space for 60 files) is given a number. This allows the file to be loaded or chained by typing just its number and one of the function keys, thus saving a considerable amount of typing.

From the catalogue I loaded Deathwatch again, but this time it took 40 seconds to load. This comprised 20 seconds winding time (searching for the correct spot on the tape) and 20 seconds load time as before.

This is because the Hobbit has only one speed in forward or backward directions and so the total load time for any program will depend on where the tape starts from.

This winding time is often referred to as the access time, and on this system is highly variable.

On a conventional tape system the access time involves finding the right tape and rewinding it, then zeroing the tape counter before winding onto the start of the program.

Viewed in this light, the Hobbit is fast and convenient, but when compared to a disc it is painfully slow.

The Hobbit handles files in a much more sophisticated way than the Acorn disc filing system.

It uses what are known as "File Control Codes", careful use of which allows several different options when saving a file of the same name as one already on the tape.

Also the Hobbit allows up to five files to be opened at any one time, something not possible with normal tape systems.

In addition, it is possible to have two Hobbit drives connected at the same time.

When the Hobbit was operating I noticed that any flashing colours on the screen stopped, as did the real time clock. This is because the Hobbit disables the interrupts while the Micro "concentrates" on finding the right place.

I tried to transfer some of my disc files onto the Hobbit but found it would not work with the disc filing system ROM installed.

When in use the Hobbit uses more RAM space than discs, as PAGE is set to 1C00. Some programs are supplied with the Hobbit which enable you to relocate the software needing the extra RAM.

When you consider that the price of the Hobbit is just under half that of a disc upgrade and single drive, it is a very attractive proposition.

It lies half way in capability and convenience between disc and tape filing systems.

My only reservation is over software support from people other than the manufacturers.

You will be able to use most of the software available for cassettes, but these will not utilise all the capabilities of the Hobbit.

Disc software which will allow the Hobbit to be fully utilised cannot be copied onto the Hobbit system without much swapping of ROMs and intermediate storage on tape.

However, it remains a remarkable piece of equipment that is a must for speed and convenience if you are not thinking of going to the expense of discs.

This little halfling knocks spots off the humble domestic tape recorder for speed and reliability.

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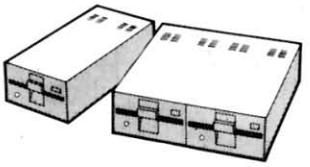

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● **MITSUBISHI** Slimline – Uncased, double density. Double track, 5¼", 1 Megabytes, track density 96TPI, track to track access time 3mSec. Plugs directly to BBC Micro.	ONLY **£220**
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● Single Drive Cable for BBC Micro	**£8**
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5¼" DISKETTES

(5 year warranty on VERBATIM Diskettes)

● 10 Verbatim or 3M Diskettes, 5¼", S/S	**£20**
● 10 Verbatim or 3M Diskettes, 5¼", D/S	**£30**

(2 year warranty on WABASH Diskettes)

● 10 WABASH Diskettes, 5¼", S/S	**£15**
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● Carriage on Drives	**£7**

PLASTIC LIBRARY CASES for Disc Storage

● 5¼" (holds 10)	**£2**
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BBC PRINTER GP100A

10" Tractor Feed,
80 columns, 30CPS
Normal & Double width Char,
Dot res graphics. Parallel Interface standard.
ONLY **£175** (£7 carr.)

SEIKOSHA GP250X:

10" Tractor Feed, 80 columns, 60 CPS, normal and double – width/height characters, 128 characters with true descenders in ROM, 64 user definable characters in RAM (384 bytes) Programmed printing (80 bytes of memory) for storing your own print sequences, dot addressable graphics with repetitive graphics data printing, RS232 and Centronics parallel interfaces standard, paper empty function and buzzer, self test routine. All this for

ONLY £235 (£7 carr.)

INTERFACES CABLE

BBC to Seikosha Cable	**£10.00**

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For SEIKOSHA GP80	**£3.75**
For SEIKOSHA GP100/250	**£3.95**

FRICTION FEED ATTACHMENT

For SEIKOSHA GP100/250	**£22**

● Spare RIBBON for GP80	**£4.50**
● Spare RIBBON for GP100	**£4.95**
● Spare RIBBON for GP250	**£5.95**

SEIKOSHA GP-700

The Colour Printer that has broken all price barriers.

A 7 colour graphic printer at the price of a standard dot matrix printer. Its unique 4 hammer method enables text and high res graphics to be drawn in 7 basic colours or 30 shades. 7 x 8 matrix. Up to 106 char. per line at 50 CPS. Variable line spacing to 1/120". Tractor or Friction feed. Centronix interface standard.

ONLY £399

GP-700 Colour Printer Screen-dump routine in ROM FOR BBC Micro	**£12**

EPSON PRINTERS

Epson RX80

100 CPS, 9 x 9 matrix, dot addressable graphics, condensed and double width printing. Normal, Italic and Elite Characters. Tractor feed, 10" max width, bi-directional, logic seeking. Centronics Interface standard.

ONLY £285 (£7 carr.)

Epson FX80

160 CPS, 11 x 9 matrix, proportional spacing, superscripts, subscripts, dot addressable graphics. Normal, Italic and Elite characters. Up to 256 user definable characters. Down loadable character set. Condensed and double width printing. Full proportional spacing. Four user defined margin positions. Tractor and Friction feed. 10" maximum width Bi-directional, logic seeking Centronics interface standard.

ONLY £388 (£7 carr.)

INTERFACES RX & FX PRINTERS

RS232	**£38.00**
RS232 plus 2K Buffer	**£75.00**
IEEE 488	**£70.00**
Parallel 2K	**£62.00**

	Ribbons	Dust Covers
MX80FT	**£4.75**	**£4.50**
MX100	**£10.00**	**£5.25**
FX80	**£4.75**	**£4.95**
RX80	**£4.75**	**£4.50**

NEW

JUKI 6100 DAISYWHEEL PRINTER

Elegantly finished; 18 cps; bi-directional - logic seeking; 10, 12, 15 CPI; proportional spacing; 100 character "drop-in" daisywheel; Triumph-Adler compatible; supports all Wordstar features; Diablo protocols; IBM Selectric ribbon; 2K buffer standard; connects directly to BBC Micro.

A bargain at **£385** (£7 carr.)

BROTHER 8300 DAISY WHEEL PRINTER/TYPEWRITER

Provides high quality type in six interchangeable styles. Ideal for business use. Friction feed; 11 cps; 12 inch max. width; 5 different colour ribbons; portable; hard top cover with carrying handle; connects directly to BBC Micro.

ONLY **£395** (£7 carr.)

NEC PC8023BE-C:

100 CPS. Bi-directional, logic seeking, 80 columns, 7x9 Dot Matrix head, true descenders on lower case. Superscript, subscript and underlining. Single sheet Friction or Tractor feed. Hi-resolution block graphics, 2K Buffer, etc. All this for only **£320** (£7 carr.)

INTERFACES

BBC – NEC Interface Cable	**£11.00**
RIBBON	**£6.90**
DUST COVER	**£4.50**

LISTING PAPER

8½" x 9½" Fanfold paper plain or ruled (1000 sheets) **£7** (£1.50p carr.)

15" Fanfold paper (1000 sheets) **£9** (£1.50p carr.)

Teleprinter Roll (econo paper) **£4** (£1.50p carr.)

PRINTER LEAD 36"

Ready made printer lead to interface BBC Micro to EPSON, SEIKOSHA, NEC, etc., Printers.

ONLY £11

NEW

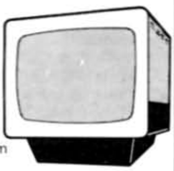
BBC Micro WORD-PROCESSING Package

A complete word processing package consisting of: BBC Model B, Zenith 12" Green Monitor, Twin 200K highly reliable (1 year warranty) Twin Cased Disc Drives with own power supply, the popular WORDWISE word processor, Watford's own highly sophisticated 62 File DFS interface fitted, the world renowned Brother 8300 Daisy Wheel Printer/Typewriter, Gemini's Beebplot & Beebcalc Spreadsheet Analysis Software tapes, 10 blank diskettes, 500 sheets of Fan-Fold paper, Manuals and all the leads.

All you require is a mains power point to have it up and running (we even supply the 4 way mains socket).

ONLY **£1,350** (carr. £15)

MONITORS



MICROVITEC 1431
14" Colour Monitor, RGB Input. (as used in BBC programmes) FREE Interface Lead. **£249** (carr. £7)

- **KAGA RGB** 12" Medium Resolution Colour **£219** (Carr. £7)
- **KAGA RGB** 12" High Resolution Colour **£259** (Carr. £7)
- **BNC** Connecting Lead **£3**
- **RGB** Connecting Lead **£5**

ZENITH 12" Green Monitor. Hi-resolution **£75** (£7 carr.)

CASSETTE RECORDER & ACCESSORIES

Top quality Slimline, portable Cassette Recorder for Computer use. Mains/Battery, operated with counter. **£24.00** (Carr. £1.50)

CASSETTE LEAD
For our Cassette Recorder to BBC Micro **£2.00**

C12 Computer Grade **CASSETTES** in library cases. **40p**

READY-MADE LEADS for BBC

CASSETTE LEADS 7 pin DIN Plug	
to 5 pin DIN Plug + 1 Jack Plug	**£2.00**
to 3 pin DIN Plug + 1 Jack Plug	**£2.00**
to 7 pin DIN Plug	**£2.50**
to 3 Jack Plugs	**£2.00**
6pin DIN to 6 pin DIN Plug (RGB)	**£2.50**
Monitor Lead, BNC to PHONO	**£3.00**

Disc Drive to BBC Micro Power Lead
Single: **£3.00** Dual **£3.75**

MISCELLANEOUS CONNECTORS

	Plugs	*Sockets*
RGB (6 pin DIN)	**30p**	**45p**
RS423 (5 pin Domino)	**30p**	**40p**
Cassette (7 pin DIN)	**25p**	**65p**
ECONET (5 pin DIN)	**15p**	**25p**
Paddles (15 pin 'D')	**£1.10**	**£2.15**
Disc to BBC Power Plug 6pin	**70p**	
Disc Drive Power Plug 4pin	**60p**	

BEEBPLOTTER

The Unique Graphic Tablet

Watford Electronics' BEEBPLOTTER will work with 32K BBC Micro. Connects to Analogue port. The unique design makes it accurate and simple to use. Attractively finished. The comprehensive booklet supplied describes its use in detail and shows some of the possible applications.

The special features include:-

- Works in all graphics mode and any colour selectable.
- Commands printed on Tablet and On-screen instructions.
- Special routines enable pictures to be quickly loaded from tape.
- Works with all operating systems and ECONET. Tape and Disc versions available.
- Large drawing area (32cms x 23cms).
- Maps, Pictures and Diagrams produced quickly and easily.
- Transparent tablet enables maps and diagrams to be copied directly from books.
- Commands include line, circles and rectangle drawings, infilling, full editing and an easy to use copy and move feature.
- Screen dump routines included for Seikosha and EPSON printers.
- Routines are included to allow user to incorporate pictures in their own programs.
- Designed by a professional teacher with educational uses in mind.

ONLY **£75** (£3 carr.)

13 ROM SOCKET BOARD

Are you wondering where to fit new ROM based software inside your computer in addition to the BASIC, WORDPROCESSOR, DFS, and FORTH ROMS? Then our add-on 13 ROM Socket Board is the answer. Simply plugs into one of the four ROM sockets currently available in BBC Micro. There are only 4 solder connections to be made. Full instructions are supplied.

Our 13 ROM SOCKETS BOARD enables the **User to increase the Sideways ROM capacity** the basic four sockets on the main board upto the full SIXTEEN capable of being supported by current operating systems. In addition the board is designed with the facility to hold upto 16K RAM, which when switched into operation is automatically selected by any WRITE signal to the Sideways ROM area. This gives the User the ability to write a utility or language and upon pressing break have the utility or language up and running (new ROM software can be developed and tested in situ.)

The Board gives the User, plenty of freedom to explore the possibilities of the new paged ROMs due in the coming months and offers them the chance to develop their own.

All essential lines are buffered and the Board meets or exceeds all timings for operation in the BBC Microcomputer. When fully populated, the ROM Board consumes less than half the recommended maximum current limit.

Supplied ready-built and tested complete with fitting instructions.

ONLY £35 (carr. £1)
(Fitting optional extra £10)

CMOS RAM for the 13 ROM SOCKET Board

6116-150nS (2K)	**£3.40**
6264-150nS (8K)	**£38.00**

EPROM for the BBC MICRO & 13 ROM SOCKET BOARD

	1+	25+
2764-250nS	**£ 4.20**	**£ 3.75**
27128-250nS	**£23.00**	**£19.00**

EPROM PROGRAMMER for BBC MICRO

At last! – the EPROM Programmer for BBC Micro Computer from WATFORD ELECTRONICS that will suit both your pocket and all your requirements. Programs all popular types of EPROMS from 2K bytes up to 16K bytes – **2764 — 2516 — 2532 — 2564 — 2764 — 27128.**

This extremely powerful system is designed for your needs of TODAY & TOMORROW! – BBC Basic programs can be copied into EPROM and subsequently re-loaded faster than from a disc! Suitable for both hobbyist and professional users!

Just look at these features:

- **COMPLETELY SELF CONTAINED** – Housed in its own sturdy case – Uses its own Power Supply – Connects directly to the 1MHz Bus – Simple and Safe!
- **FULL SOFTWARE SUPPORT** – Comes complete with simple to use ROM based software – Facilities include Varification, Reading, Virgin Testing, Writing, Editing, Saving, Loading and more! NOTE!! – This software does NOT simply comprise hastily prepared routines to get you going, but is a professional, purpose designed applications package.
- **ACORN BUS COMPATIBLE** – Use of the 1MHz connection complies with all Acorn addressing recommendations – That means you can still add-on such things as the TELETEXT, IEEE 488 and PRESTEL Adaptors without having to disconnect everything.

You don't need just any Eprom Programmer – you need **WATFORD ELECTRONICS** EPROM PROGRAMMER System.

ONLY **£78** (£2 carr.)

Price includes software in ROM and Manual)

NEW – NEW – NEW

Watford Electronics' own

BEEBMON

A ROM based machine code Monitor for the BBC Micro. It enables machine code programs to be debugged and altered easily and quickly. Being a ROM, its Commands are always readily available and occupy no USER memory.

The special features includes facilities like: TABULATE, MODIFY, FILL, COPY, COMPARE, SEARCH (Hex & ASCII), CHEKSUM, DISASSEMBLE, RE-LOCATE, SINGLE STOP, SET BREAK POINTS, SCREEN DUMP ROUTINE, DUMB TERMINAL and many more facilities.

£22

BBC LIGHT PEN KIT

All parts available as per Acorn User's 'SHINE A LIGHT' Light Pen article.

Kit Price: **£9.95**

BBC JOYSTICKS

Two versions available:

SINGLE: Player type	**£7.00** each
TWO Players type	**£11.50** per pair

WATFORD ELECTRONICS

Continued →

★ NEW ★
BBC MICRO DFS

by Watford Electronics

This powerful new DFS is fully compatible with ACORN DFS yet has much increased power due to additions, carefully designed to make life easier in normal use. It consists of over 14K of efficiently written machine code. It is entirely self contained and so does not require a utilities disc to function.

- The system can either use the ACORN standard 31 files per disc side or DOUBLE THE CAPACITY to 62 files. The size is selected at formatting time. Copying between discs with different catalogue sizes works perfectly normally.
- A FORMATTING PROGRAM is built in, permitting formatting to 35,40,80 track formats with either 31 or 62 files. Since the formatter is built in to the DFS it can be used without affecting whatever program you are using.
- A DISC VARIFIER is also built in. This checks the internal checksums on each sector to identify any corrupted data. This is extremely useful when saving valuable data as it shows faulty discs quickly and easily. Again it does not affect the program you are using.
- A built in DISC SECTOR EDITOR gives a screen window onto the disc enabling detailed editing of any byte on the disc. This is very useful for recovering accidently deleted files and can save weeks of work.
- A double step mode allows the user of 80 TRACK DRIVES TO READ 40 TRACK DISCS. This mode is software selected for each drive individually, thus allowing a 40 track disc to be copied onto an 80 track one very easily. THIS ELIMINATES THE NEED FOR EXPENSIVE SWITCHABLE DRIVES.
- A WORKFILE function sets the name to be used when the null filename is issued. This allows a program to be edited and repeatedly saved having only typed its name once.
- When using LOAD, CHAIN, etc. it is possible to specify an ambiguous filename. This will result in the first file whose name matches the specification being used. This saves typing the end of a filename that you know is uniquely identified by its first few characters.
- Two commands exist to simplify the transfer of programs from TAPE TO DISC. These load the file to &1200, switch off the disc system and then move the file to its correct load address; thus saving a lot of complicated programming. This command can be used to load files up to 27 K5 long.
- An advanced COPY command is included which will prompt the user, requesting whether to copy each file.
- RENAME has been extended to allow the use of ambiguous filenames. This allows you to change BERT1, BERT2, BERT3 to FRED1, FRED2, FRED3 with only one command.
- OPENOUT has been improved to give you fewer annoying 'Can't extend' errors, as it automatically picks the biggest space on the disc in which to put a file. A SPACE command lets you know how much space *COMPACT could create before you waste time doing it.
- 1.75K of RAM can be taken over from the DFS for your large BASIC programs while still retaining LOAD, SAVE and *CAT and other simple commands.
- Comprehensive and clearly written Manual (available separately) gives the user a complete package deal.

Price **DFS ROM** ONLY **£42**

Complete interface kit incl. DFS ROM **£85**

Comprehensive and clearly written manual £7.50 (No VAT)

P.S.
We will exchange your existing ACORN DFS for the highly superior Watford's DFS ROM for £35. **£35**

FORTH ROM for BBC

This superb (FIG FORTH) compiling language now available in ROM. Simply plugs into one of the ROM Sockets. Full FORTH manual included. **£39**

ONLY THE BEST AT WATFORD

BBC FORTH on Cassette

Follows FORTH-79 standard and has fig-Forth facilities – Provides 260 FORTH words – infinitely extensible – Full screen editor – Allows full use of MOS – Permits use of all graphic modes, even 0-2 (just) – Easy recurtion – Runs faster than BBC BASIC. ONLY **£15** FREE 70 page manual and a Summary card.

BBC FORTH TOOLKIT

Adds following facilities to FORTH. 6502 Assembler, providing machine-code within FORTH – Turtle graphics enables easy to use colour graphics – Decompiler routines enables versatile examination of your compiled FORTH programs – Full double number set – An example FORTH program and graphics demonstration – Other useful routines – 64 page manual included FREE. ONLY **£13**

LOGO II

This language is very popular in American schools as it is an ideal educational program. It can graphically demonstrate the ideas of defined procedures, sub-routines, loops and even recursive programming. Gives excellent introduction to LOGO language for young and old alike.

£9.95

DISASSEMBLER

Will generate fully labelled assembly listings of any machine code program. Data is automatically differentiated from code and displayed together with its ASCII equivalent. Assembly listing can be saved in *EXEC format and subsequently incorporated into user programs. In our opinion this is an excellent software at an incredibly low price.

£6.95

EMULATOR

An extremely powerful and flexible machine code interpreter. Allows you to write and debug machine code as easily as BASIC. Features single step, breakpoint register display, edit modes, etc.

£7.25

Computer Concept's Firmware

BEEB-CALC **£33**

A ROM based spreadsheet program, like wordwise this firmware is fast and simple to use – yet is a powerful spreadsheet analysis program, considerably better than the original 'calc' program – full floating point maths. Works in 40 or 80 column screen modes – variable column widths. Works with either cassette or disc. This ROM coupled with Wordwise can turn your micro into an ideal small business machine.

DISC DOCTOR **£22**

This ROM contains useful disc utility programs. Enables recovery of any data off the disc including deleted files etc. The full disc editor allows the alteration of any bytes directly on the disc (or in memory), or the loading and saving of any track or sector on the disc. Automatic transfer of programs from tape to disc and vice versa. Also includes a whole host of other useful utilities – string search, function key editing, the ability to format 35, 40 & 80 track discs.

Wordwise

Without doubt the most sophisticated piece of software yet written for BBC Micro. It has all the features of a professional word processor yet is easy to use.

SPECIAL OFFER: ONLY **£34**

GEMINI'S BUSINESS SOFTWARE

Written by professional Chartered Accountants and coded by competent programmers. Ideal for small and medium sized companies. Now available from stock.

Cashbook Accounts	£52
Final Accounts	£52
Invoices & Statements	£17.25
Commercial Accounts	£17.25
Mailing List	£17.25
Database	£17.25
Stock Control	£17.25
Home Accounts	£17.25
Beebcalc Spreadsheet Analysis	£17.25
Beebplot	£17.25

N.B. All the above Gemini software is on tape. For Disc Based (40/80 track) please add £3.

BOOKS (No VAT on Books)

30 Programs – BBC Micro	£4.95
30 Hour BASIC (BBC Micro)	£6.00
6502 Application Book	£10.25
6502 Assembly Lang. Programming	£12.50
6502 Assembly Lang. Subroutines	£11.80
6502 Software Design	£10.50
ACORN ATOM Magic Book	£5.50
Advanced 6502 Interfacing	£10.95
Assembly Lang. Programming for BBC	£8.95
Assembly Lang. Prog. on BBC Micro	£7.40
BASIC Programming for BBC Micro	£5.95
BBC Forth	£7.50
BBC Lisp	£7.50
BBC Micro An Expert Guide	£6.95
BBC Micro ROM PAGING System Explained	£2.95
BBC Micro DFS Manual	£7.50
BBC Micro Revealed	£7.95
BBC Micro Instant Machine Code including Software Cassette	£34.00
Creative Adventure Programs on BBC Micro	£6.95
Creative Graphics on BBC Micro	£7.50
Discover BBC Machine Code	£6.95
Discover FORTH – Osborne	£11.25
Easy Prog. for BBC Micro	£6.50
35 Educational Programs for BBC Micro	£6.95
Further Prog. for BBC Micro	£6.90
FORTH Programming (Sams)	£12.50
Games BBC Computer can Play	£6.95
Getting Acquainted/Acorn ATOM	£7.95
Graphs & Charts on BBC Micro	£7.50
Intro to Micro Beginners Book (3 Ed.)	£9.90
Let your BBC teach you to program	£6.75
Micros in the Classroom	£4.90
Practical Prog. for BBC & ATOM	£5.95
Programming the 6502	£10.75
Mastering VISICALC (Sybex)	£11.95
Structured Prog. with BBC BASIC	£9.50
The BBC Micro An Expert Guide	£7.90
The BBC Micro Book, BASIC, SOUND & GRAPHICS	£7.40

BBC DFS MANUAL

A fully comprehensive disc manual for BBC Micros. All extra commands are included. A bargain at **£7.50** (no VAT).

BBC MICRO ROM PAGING SYSTEM Explained £2.75

A comprehensive explanation of the requirements for Sideways ROMs to be used in the BBC Micro. Language and Service entries are explained with their call numbers. This book contains all the information that we have discovered in writing our 16K BBC DFS. A must for all serious users of BBC Micro.

ONE STOP SHOP

BEEB SPEECH SYNTHESISER

VERSATILE SPEECH SYNTHESISER UNIT FOR THE BBC MICROCOMPUTER

Watford Electronic's very own Speech System. Specially designed so that even a novice can make his BBC talk:-

SIMPLY the best! – An unlimited speech synthesis system. Complete with easy-to-follow manual. Controlling software is in ROM so no Cassette Loading problems!

PHONEMES for word synthesis – That means unlimited vocabulary! No extra speech dictionary chips to buy!

BUILT-in Library of approximately 500 words to get you started.

ENGLISH accent – Utilises inflexion techniques to produce highly comprehensible speech.

EASY to use system – Just plug the software ROM into a socket, the Speech unit into the User Port, and away you go! No specialised 'dealer upgrade' required!

COMPACT unit – The whole system is built into a small case – easily tucked behind the computer. Auxillary output socket provided for direct connection to an external amplifier.

HOURS of fun! – Suitable for any application – Games, Educational Programs, Specialised Packages.

We know this all seems to good to be true but DON'T BE LEFT SPEECHLESS! Order your Versatile Speech Unit now!

Only £39

TEX EPROM ERASERS

• New Broom for EPROMS •

EPROMs need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well earned break. Cool, gentle and affordable. EPROMPT does it properly.

Two versions available:

- **EPROMPT EB** – The standard version. Erases up to 16 chips. **£32.00**
- **EPROMPT GT** – Erases up to 32 chips. Has an incorporated safety switch which automatically switches off the UV lamp when the Eraser is opened. **£37.00**

TEXTIME

(SOLID STATE ELECTRONIC TIMER)

EPROM Erasers need just half an hour to finish their job. It is the proper erase time for all EPROMs. While the Eraser is busy you may take a break but not for too long without our TIMER on the job. Over erasing can shorten data storage time. TEXTIMER will remember to switch off the lamp and your chips will forget nothing new. TEXTIMER will pay for itself in no time.

ONLY £15.00

GAMES SOFTWARE

PROGRAM POWER

ADVENTURE	£6.95
ALIEN DESTROYER	£6.95
ANDEROID ATTACK (C.Concept)	£6.95
CHESS	£6.95
COWBOY SHOOTOUT	£5.95
CROACKER	£6.95
ELDORADO GOLD	£5.95
Escape from Moonbase ALPHA	£6.95
GALACTIC INTRUDER	£6.95
GALACTIC COMMANDER	£6.95
KILLER GORILLA	£6.95
LASER COMMAND	£6.95
MUNCHYMAN	£5.95
MASTERMIND	£4.95
MOONRAIDER	£6.95
MICRO BUDGET	£7.95
ROULETTE	£6.95
SPACE MAZE	£6.95
SWOOP	£6.95
SEEK	£5.95
TIMETREK	£6.95

LEVEL 9 ADVENTURE GAMES

COLOSSAL ADVENTURE. The classic mainframe game "Adventur" with all the original treasures and creates + 70 extra rooms.
£8.65

ADVENTURE QUEST. Through forest, mountains, desert, caves, water, fire, moorland and swamp on an epic quest vs tyranny.
£8.50

DUNGEON ADVENTURE. The vast dungeons of the Demon Lord have survived his fall. Can you get to their treasure first.
£8.50

EDUCATION Software

JUNIOR MATHS PACK (32K) **£6.95**
Makes learning fun for 5-11 year olds. This package consists of 3 programs (menu driven) that increase in difficulty as your child becomes competent. A very good supplement to standard educational methods.

WHERE? **£6.95**
Do you know WHERE? you are? This well written program, using high resolution graphics offers timed tests on the geography of Great Britain.

WORLD GEOGRAPHY (32K) **£7.00**
Beautifully drawn Hi-Res colour map of the world illustrates and aids this graded series of tests on capital cities and populations of the world.

WORDHANG **£7.80**
(Age 7-13). A word guessing program based on the well known Hangman game. Uses full colour graphics. Complete with 260 words and the facility save your own list of words.

WORLDWISE **£7.80**
(Age 7-15. Two constructive geography programs allowing children to build detailed data bases covering both the UK and the world. Encourages children to refer to atlas and reference books. Save the database anytime.

ANIMAL/VEGETABLE/MINERAL **£4.95**
(Age 7-13). Provides an opportunity for children to teach the computer to differentiate between objects. The program tries to guess the object the child has thought of, using personalised responses like Mmm . . . I am thinking.

BRITISH GEOGRAPHY **£6.95**
Teaches a child the locations of Cities and Ports using directional keys.

CAROUSEL **£5.50**
Aimed at junior school age. Sequences of colours and sounds teaches a child to concentrate.

HAPPY NUMBERS **£7.80**
(Age 4-6). No reading skills are required to use this colour graphics number recognition and counting program. Children build patterns of flowers corresponding to figures, quickly learning their significance.

INTRO TO ARITHMETIC **£10.45**
4 programs – Additions, subtractions, multiplications and divisions. Help stage, moving graphics and colours. Worksheet produced at the end of program. (5-7 years old).

WRITING **£5.50**
Full screen demonstration of correct formation of lower case alphabetic characters. Several choice of sequence (5-7 years).

PLINTH FOR BBC MICRO

Protect your micro from the weight of the heavy TV/Monitor. This sturdy plinth is attractively finished in BBC colour. It can be used to support a monitor or a printer. The micro slides underneath comfortably. A must for every BBC Micro owner, specially for those who have to move/open their computer frequently.
Price: £11.95 (carr. £1.50)

PLINTH FOR PRINTERS

Keeps your desk tidy. Place the printer on the plinth and the paper underneath. Finished in BBC colour.
£11.95 (carr. £1.50)

★ NEW ★ CORONA SOFTWARE

Highly acclaimed at the BBC Micro User Exhibition

GEOGRAPHY – FRANCE	£5.50
GEOGRAPHY – GERMANY	£5.50
GEOGRAPHY – SPAIN	£5.50
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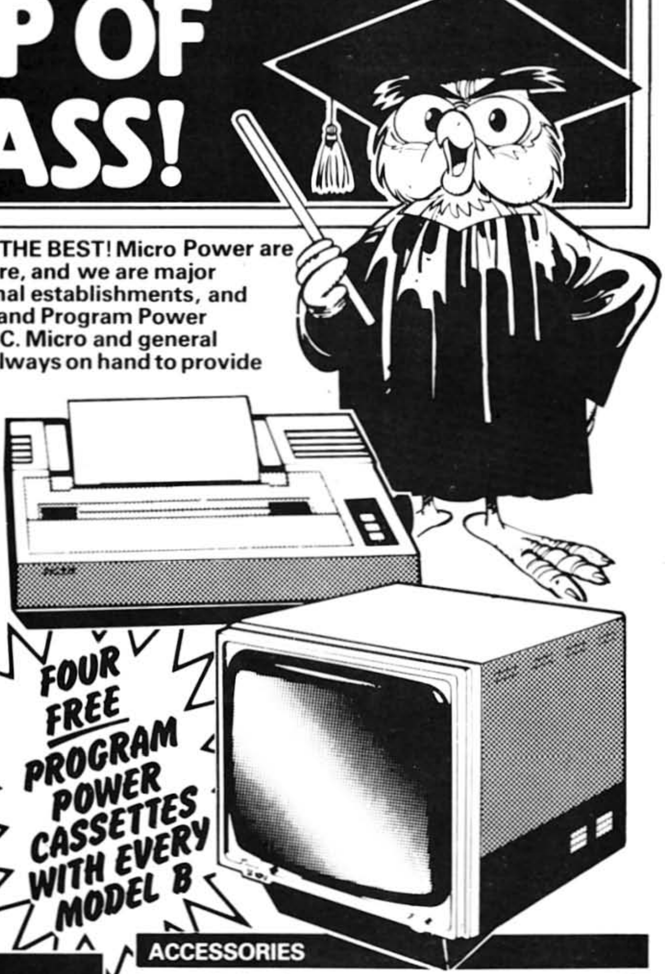
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MICROPOWERMICROPOWER

Take to the fields with SPC

By NIGEL PETERS

I THOUGHT for a while that the editor was waxing lyrical. "What about fields and spaces?" he murmured as he passed my desk on the way to his abacus appreciation course.

"Very pastoral, sir", I fawned.

"No, idiot, what about your article on print field formatting and the SPC command."

I should have known.

WELL SPC is a very simple Basic command. Having said that, aren't they all until you start to use them!

Seriously though, SPC is simple to use. As you might guess it's concerned with spaces. You use it after a PRINT statement to put spaces between print items.

The format is SPC(n), where n is the number of spaces you want inserting. For example you might want to print a name with five spaces between each word and so have a line like:

```
100 PRINT"A";SPC(5);"B" ;SPC(5);"C"
```

This will print:

```
     A          B          C
```

on the screen.

See what I meant by simple? SPC can make your output more legible and also, as I'll come to later on, can help avoid errors arising from poorly thought-out screen displays.

While you've been using the PRINT statement to put things to screen you may have noticed a small problem. Sometimes when the answer to a calculation fills all 10 spaces of a print field it can run into the field next to it. This gives what looks like one large answer instead of two.

Take a look at Program I. It shows how such overflowing may lead to problems.

```
10 REM PROGRAM ONE
20 LET X=100
30 PRINT X/10,X/3,X/5
```

Of course you can get round this by using the SPC command

→

From Page 31

mentioned earlier or printing each answer on a different line.

There is, however, another way. You can alter a system variable which will change, among other things, the number of characters you can have in a print field.

This variable is @%. The % sign is upper-case 5 and @ can be found on the keyboard to the right of the letter P.

@% is an integer variable and its value determines the number of characters there will be in each print field. For example:

```
@%=20
```

gives print fields 20 characters long. If you want to get back to the normal setting all you have to do is to enter:

```
@%=10
```

which sets the print fields back to the values they are when you switch the micro on.

Program II will allow you to experiment with field lengths to your heart's content. Press Escape when you've had enough.

```
  10 REM PROGRAM TWO
  20 REPEAT
  30 INPUT "How long do you want your
fields",field
  40 LET @%=field
  50 IF field >40 THEN PRINT "WHY
BOTHER?"
  60 PRINT 1,2,3,4
  70 PRINT "a","b","c","d"
  80 UNTIL FALSE
```

You can now see that you can sort out Program I with a line such as:

```
5 LET @%=20
```

But remember that when you've run the program the fields will remain set at 20 characters long until you either reset them or switch the micro off.

Now you know how to vary the print fields. Simple isn't it?

So far it is, but from here on in it gets more complicated.

This is because there's a lot more that you can do with @% than just use it to play around with the field lengths. However don't worry if you don't understand what follows first time round.

When and if you ever need to know more about @% and print field formatting you will understand it more easily in the light of what you intend to do.

As the editor says in his forthcoming book "Zen in the Art of Programming": "You already have the solution. However you will not know you have it until you meet the problem."

When we used @%=20 to divide the screen up into print fields of 20 characters in length we were only using part of its scope.

It can also be used to control how numeric output is presented on screen and to what accuracy.

For example, if we enter:

```
@%=&02030A
```

into the micro not only will we have print fields 10 characters in length but also all figures printed will be to three decimal places of accuracy.

We have this control over how numeric output is displayed because @% can be used to select between three different screen formats.

This is achieved by treating it as a three byte hexadecimal number of the form:

```
@%=&xxyyzz
```

If you don't know what a hexadecimal number is don't worry too much. You can understand what follows by looking on xxyyzz as a code number that the micro uses to find out how it should print numbers on the screen.

Let's take the xx part first. This can have three values, either 00, 01 or 02. These numbers determine which of three print formats the micro will use.

If you type in 00 in the place of xx in @%=&xxyyzz you put the micro in what is known as General Format.

General Format is basically the format the micro is in when you switch on. It allows you to print numbers to the screen as normal.

It only goes into the exponential form when it has filled up the print field you've allocated. Or if you've decided on going to the exponential form of representing numbers after a fixed number of figures.

This is what the yy and zz parts of the code are for.

The zz is simple enough. It is the length of the print field that you want in hexadecimal. This means that if you want a field 10 characters long zz becomes OA.

The yy tells the micro how many character spaces of the chosen field can be used before it must start printing numbers in the exponential form.

Suppose you entered:

```
@%=00030A
```

What you have done is to select the General Format (xx=00), told it that after the numbers it prints are over three figures long it will have to display them exponentially (yy=03), and that the print fields are to be 10 characters long (zz=0A).

Don't worry too much if this doesn't make much sense at first. It's one of those things that is difficult to grasp in theory but easy in practice.

A few minutes playing around with the example program will make it clear.

The second format is the Exponential Format. In this, as you might guess, numbers are displayed in the exponential form. It means that the numbers are expressed as decimals multiplied by the appropriate power of ten.

The decimal comes first, then the letter E to show that it's an exponential, followed by the power of 10.

For example, in exponential form:

100 becomes 1E2 (1 * 100)
1230 becomes 1.23E3 (1.23 * 1000)

We obtain exponential form by entering 01 in the place of xx.

Once in Exponential Format we can use the value of yy to specify how many figures we want before the E of the exponential.

If we want two figures before the E (not counting the decimal point) we let yy become 02.

As you might expect zz is used to choose how many characters are wanted in the print field.

Suppose we entered:

```
@%=&010408
```

What we get is the Exponential Format (xx=01), four figures – and a decimal point – in front of the E of the exponent (yy=04), and the print fields are set at eight chracters (zz=08).

Again, don't worry too much if this isn't clear at first. Just play around with Program III. First input 10 ,100 ,1000 ,10000. Then become more adventurous with your numbers.

You'll soon see how Exponential Format works and the effect the yy part can have on the accuracy of the figures displayed.

The final format is the Fixed Decimal Format, selected by entering 02 for xx. This allows us to select how many decimal places we require in our output by using yy to specify them.

As usual zz is used to determine the print fields.

As an example try:

```
@%=&02030C
```

You will have selected the Fixed Decimal Format (xx=02), the figures

→

will be accurate to three decimal places (yy=03) and the print fields will be 12 characters long (zz=0C). Remember it's hexidecimal. Note that you can only go to nine significant figures.

That's it – those are the three types of print formatting. It's all summed up for you in Figure I. Easy isn't it?

Well, maybe not at first but Program III should help:

```
 10 REM PROGRAM THREE
 20 INPUT "Four numbers",a,b,c,d
 30 REM General Format
 40 LET @%=&00030A
 50 PRINT a,b,c,d
 60 REM Exponential Format
 70 LET @%=&01030A
 80 PRINT a,b,c,d
 90 REM Fixed Decimal
100 LET @%=&02030A
110 PRINT a,b,c,d
```

Program III

This allows you to put in four different numbers and see how they are treated by different print formats.

Lines 40, 70 and 100 change the value of @% and so alter the formats. When you're feeling more adventurous have a go at changing the values of @% yourself.

A little playing on the micro and you'll soon become an expert on print formatting.

And so we come to the end of our dealings with the PRINT command. It may seem like a lot of fuss over a fairly simple keyword, but I think it's worth it.

Remember that no matter how brilliant your program is it will probably be judged by the output it produces. So if you want your work to be appreciated use PRINT wisely.

Myself, I just hope that the editor appreciates my work and gives me a holiday. I could do with a break in the fields and open spaces.

FORMAT	XX	YY	ZZ
General	00	number of places until exponential form used	field length
Exponential	01	number of figures in front of E	field length
Fixed Decimal	02	number of decimal places	field length

Figure I:

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JIM NOTMAN reviews the latest Amcom DFS

SINCE I looked over an early release (serial no. 1631) of the Amcom DFS last month I've had the opportunity of comparing it with a new version (serial no. A7370) in which a number of modifications have been made.

If school reports were given for software, this one would read "Amcom's performance has greatly improved this term, showing promise for the future".

The Acorn mode has been altered to make it more compatible with software written to take advantage of the special features of the Acorn DFS.

It now supports the *ACCESS command, and the OSGBPB calls 5, 6, 7 and 8 now work as expected.

OSWORD calls &7D and &7E are still not standard. OSWORD &7E is of use in file management as it should read the number of sectors on the disc.

*DELETE will delete an open file from the directory, leaving data in a buffer. The Acorn DFS would give the "File open" error in this case.

The "Disc fault" error does not give the error number that is returned by the floppy disc controller (the 8271), which would be useful in fault finding.

The disc handling still takes place with the interrupts disabled. This is something to be aware of as it affects the system clock (TIME) and all the other functions driven by interrupts.

The most noticable improvement has been in the speed of operation. The first version tested was rather disappointing in this respect.

All the benchmarks now run with the Amcom DFS.

Such was the improvement in speed, especially with some of the relative file handling (PROG8A) that I used several different timing devices to ensure the accuracy of the observations.

As can be seen from the revised comparative benchmark results, no DFS is fastest in every aspect, but Amcom now shows its pace in reading data from the disc.

Watford have just told us that they have made some improvements to their DFS too. As soon as we get the new version we'll let you know about it.

No.	Benchmark	Acorn 0.90	W.E. 1.00	Amcom A7370
	*SAVE 16K	2.7	3.6	6.7
	*LOAD 16K	2.5	2.4	3.8
	*BACKUP	28.0	28.0	36.9
1	OPEN + CLOSE files *1000	4.2	6.4	5 for 10
2a	PRINT 1000 numbers	15.1	10.4	11.6
2b	PRINT 100 strings	59.6	45.1	63.9
3a	INPUT 1000 numbers	13.0	9.1	6.0
3b	INPUT 100 strings	55.2	42.4	23.6
4	BPUT 1000 bytes	4.9	4.3	6.3
5	BGET 1000 bytes	4.6	4.1	3.3
6	move PTR 1000 places	2.3	2.7	3.0
7a	write test relative file	60.9	45.6	67.1
7b	read test relative file	56.8	44.1	24.5
8a	write relatvive file backwards	234.6	137.6	82.5
8b	read relative file backwards	97.5	56.0	39.6

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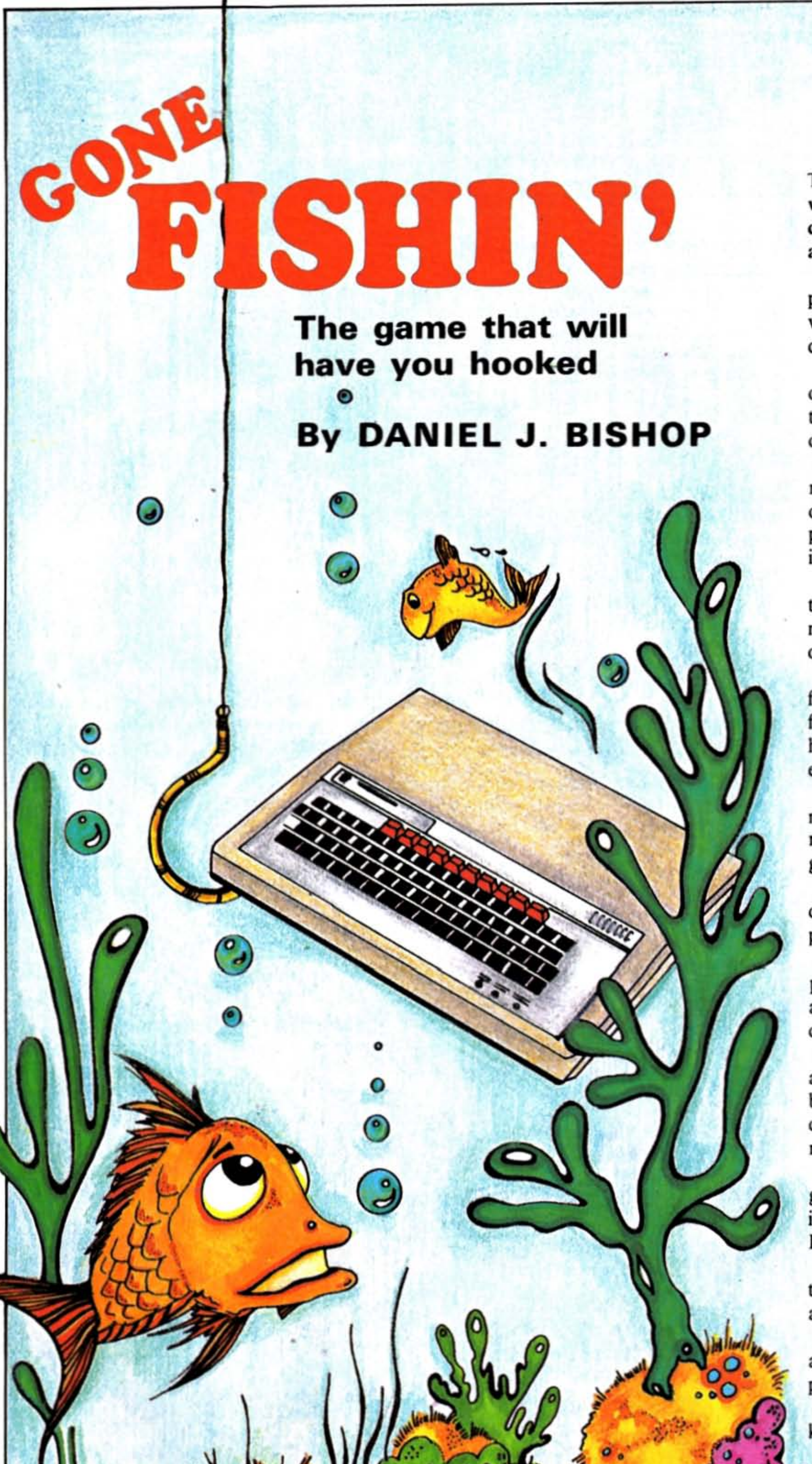
GONE FISHIN'

The game that will have you hooked

By DANIEL J. BISHOP



THE noble sport of angling is simulated very realistically in this game. The main difference is that you do not have to wait an hour for a bite!

It uses Mode 7 and Mode 5 graphics, and should run on all model B versions of the BBC Micro, including disc systems.

Up to four anglers may take part. The object of the game is to catch the most, the biggest and best fish from the waters of Lake Beeb.

There are ten species of fish which may be caught. Each angler can alter his or her tactics during the game by pressing any key and then issuing instructions to the computer.

An angler can fish far out or near to the bank, at the bottom of the lake or near the surface, using maggots, worms or bread as bait.

Experienced anglers will learn the feeding habits of the various types of fish. However, such rules do not always hold true, because there is a random element throughout the game.

The anglers decide how many minutes the game will last – to a maximum of 60 – but may end the game at any time.

When the program starts, a title display in Mode 7 appears, accompanied by a jingle.

When a key is pressed, there is a page of brief instructions. Press the key again and a plan view of Lake Beeb is drawn in blue and green.

The number of anglers, time of play and names of anglers are asked at the bottom of the screen. Answer these questions and press return after each reply.

As each person inputs their name, a graphical representation of each angler is drawn, standing on the banks of Lake Beeb. The game proper then begins.

When an angler's float disappears, the angler must strike quickly by hitting any key (the spacebar is easiest).

If the fish is caught, it is reeled in. You are told its weight, name and number of points gained.

To instruct the computer, press any key. Then enter your name.

After the prompt "OK?" enter your instruction, which must be one or more of the following commands: NEAR, FAR, TOP, BOTTOM, BREAD, WORM, MAGGOT, FINISH, HELP.

The command FINISH ends the game. The command HELP produces a list of all the commands.

Turn to Page 99

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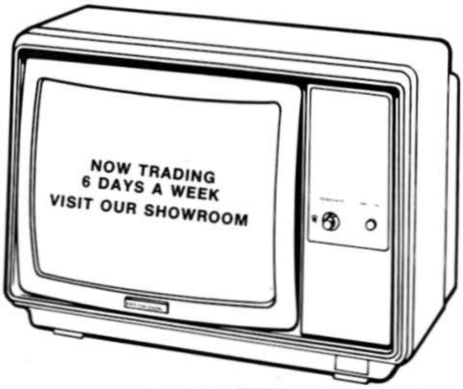

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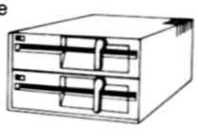

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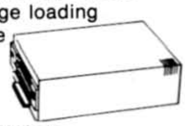

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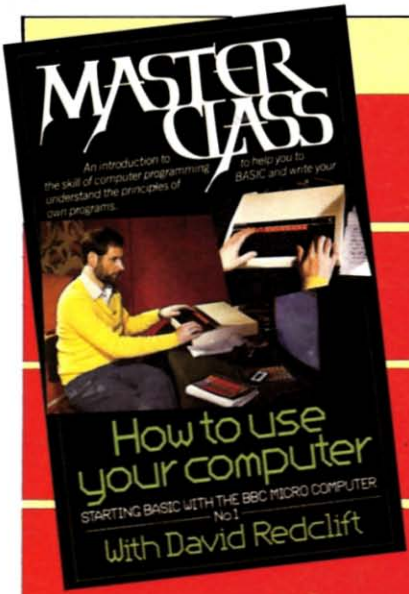
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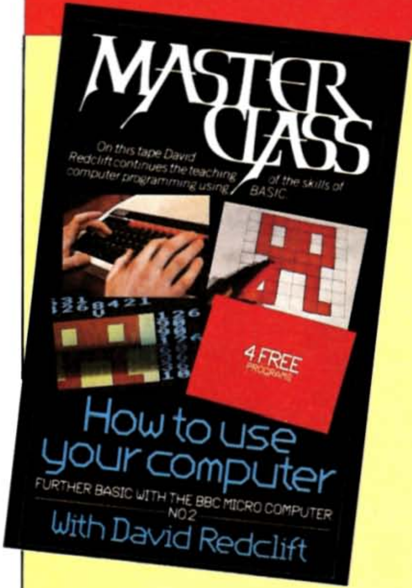
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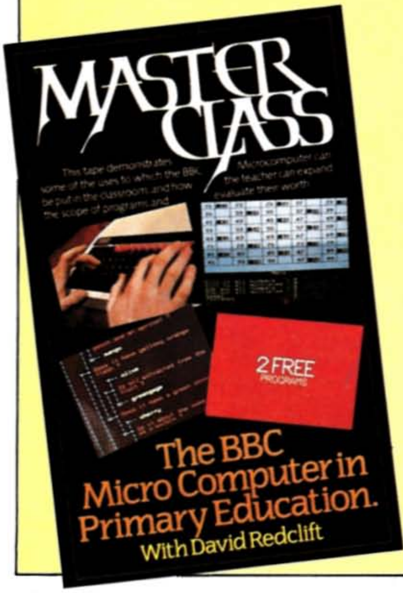
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PART 6

WHY
STRUCTURED
PROGRAMMING
?

Bad language breaks all the rules

". . . a perfect method should not only be an efficient one, as respects the accomplishment of the objects for which it is designed, but it should in all its parts and processes manifest a certain unity and harmony." – An Investigation of the Laws of Thought, George Boole, c. 1850.

A RIGOROUS presentation of the principles of structured programming would be out of place in this article and not very helpful. For example, the use of procedures and a wide understanding of their value and usage probably came well before the refinement of the structured techniques for handling repetition and decision-making.

But structured programming (SP) without proper use of procedures would make little sense in BBC Basic, and they are regarded here as an integral part of the SP method.

Such matters as the choice of names for variables, procedures or other program objects, indenting, the use of upper and lower case, are more to do with style and presentation than control.

But the writer would find it difficult to discuss structured programming without mentioning them. It would be like Abbott without Costello or love without marriage — possible but not entirely satisfactory.

Strictly speaking, the principles of SP are independent of language. Nevertheless Wirth invented Pascal because he felt that the language syntax should reflect the desired principles.

Christensen took the same idea a stage further with Comal, aiming at ultimately simple forms. More recently Tony Hoare has remarked that a programmer is surrounded by complexity and the language he uses should be a part of the solution, not an additional problem.

By ROY ATHERTON

Perhaps this series of articles is really about common sense and being systematic, even to the point of elegance. These things are not wholly objective and this final summary of principles has a personal slant.

The basic trouble with computers is not only that they don't speak our language. They operate differently, sequencing events in time, while we are more at ease with relations in space – writing, mathematical arguments, lists on paper.

A computer program is spread out in space, but the events it describes happen in time. A good programmer eventually learns to look at the static text and imagine the events in time.

As Dijkstra puts it so admirably: "We should do . . . our utmost to shorten the conceptual gap between the static program and the dynamic process." But how is it done?

The central idea is that a program should reflect its function at three levels – design, coding and presentation. This makes it easier to look at the program

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and imagine what it does at execution time.

The rules given here under those three headings may guide a programmer and make achieving this objective much more likely. The rules are not complete – just a good start – and they aim at clarity and correctness.

Alterations to achieve greater speed or compactness can be made later if necessary. This may cause a loss of clarity which can be tolerated, if the original program serves as documentation. Correctness must be preserved throughout all the changes.

Rule 1: Design

☐ *A task should be broken down into a hierarchy of subtasks and each should be a procedure, function or group of these.*

☐ *A procedure should be properly and meaningfully named, have one entry point and one exit point.*

☐ *Procedure parameters should be chosen with care.*

☐ *Within each procedure and in the main program each instance of repetition or decision-making must be identified in the pre-coding analysis.*

☐ *The conditions at entry to each loop must be established carefully.*

☐ *The condition, simple or compound, for terminating each loop should be properly identified.*

☐ *Each loop or decision structure should have a single entry point and a single exit point. No jumping into or out of structures.*

☐ *Each program element must be in one of three possible relationships. Elements may be in sequence, controlled, or the subject of procedure calls.*

Rule 2: Coding

☐ *The chosen structures for coding should reflect as naturally as possible the program design.*

☐ *The order of procedures should reflect, as far as possible, the hierarchical structure of the design. However such items as special character definitions or stored messages may be placed at the end of the program to reflect their routine nature and fairly low interest. DATA statements should be similarly treated.*

☐ *A reasonable overall structure might be:*

```
Main Program
END
Procedures
DATA statements
```

Exceptionally, small quantities of data might be placed just after the structure which reads them, but the controlling modules should not be cluttered with DATA, PRINT statements, etc.

Rule 3: Presentation

☐ *Keywords must be in upper case. Other program words (variable names, procedure names, etc.) should be in lower case.*

☐ *Indenting should reflect structure. (The LISTO facility does not work properly, and indenting must be done with spaces.) If necessary for compactness a second version without indenting may be produced.*

☐ *Blank lines or REM statements may be used to give information and help to improve layout. These can be removed in a compact version.*

☐ *Multiple line statements should be used with discretion. Overflowed lines should be avoided. Single statements within a structure on one line are reasonable. Several assignments on one line are reasonable, as are combinations of simple actions like MODE or VDU statements.*

☐ *Line numbers are necessary for program entry and editing but they may be omitted in the design and publication of programs. If GOTO and GOSUB are not used they lose their importance, except perhaps as a means of reference for discussion. In practice, discussion of a well-structured program is fairly straightforward without the help of line numbers.*

The principles and rules may seem numerous and demanding. But the practice is really quite easy if they are acquired and applied over a period.

This can be as little as a few weeks for an energetic computer buff – or as much as a year or two for a reluctant average ability secondary school pupil.

One thing seems certain. A good grasp of these matters and some practice can enable beginners in programming to take off, quite suddenly, and do non-trivial programming tasks successfully. But some problems remain.

The obvious outstanding problem is the zero case. Remember the instructions for the deputy in the gun fight with a bandit:

```
REPEAT
    Fire a shot
UNTIL Bandit throws out gun.
```

At least one shot is fired because the condition for exit from the loop is tested at the end. The bandit may be killed quite unfairly. The required structure is one which tests the condition at the beginning of the loop.

```
WHILE Bandit has gun
    Fire a shot
ENDWHILE
```

If the bandit throws his gun away immediately, no shots are fired. This zero case is as important in computing as the zero symbol is important in arithmetic.

The WHILE structure exists in most modern languages. It was specified at one stage for inclusion in BBC Basic but for some reason, probably memory constraints, it was omitted.

One way to cope with the situation is to use a procedure which is not entered if conditions indicate that no shooting should occur.

```
IF Bandit has gun THEN
PROCshoot
–
–
DEF PROCshoot
   REPEAT
   Fire a shot
   UNTIL Bandit throws gun
away
ENDPROC
```

Other solutions involve either jumping out of or round a repeat loop or simulating the WHILE structure with GOTO.

```
200 REM WHILE
210 IF Bandit has no gun THEN GOTO 240
220   Fire a shot
230   GOTO 200
240 REM ENDWHILE
```

Only by using the procedure as in the first method can the conceptual

→

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framework of structured programming be properly protected and the integrity of the structures be preserved.

Other methods are tempting but it is dangerous to make exceptions on such a critical question. Whatever one does, the WHILE concept is important in problem analysis and program design.

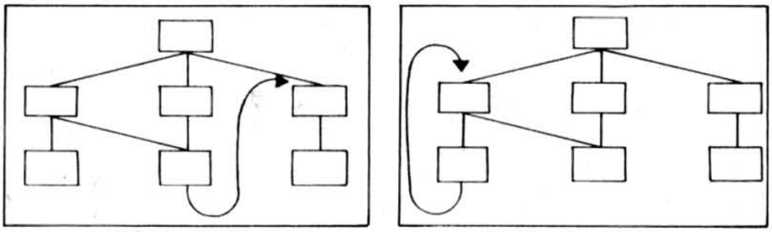
```
WHILE (Reason for looping)
    Action
ENDWHILE
```

Using such a structure as syntax helps to make it a part of one's intellectual equipment. That is the real sadness of its omission from Basic.

A second problem arises when programmers have developed a program in which many procedures call other procedures. A structure diagram shows what happens within a module (main program or procedure).

A structure *chart* shows the relationship between modules. Some relationships are permissible and some are not.

See Figure 1.



(a) Permissible *(b) Not Permissible*

Figure 1: Structure charts show procedure relationships

The danger is that a procedure may call another which leads to a call back to the first one as in Figure 1(b). This is called concealed or indirect recursion.

Unless recursion is very thoroughly understood or is a central concept of an unusual (but possible) approach to programming it should be avoided.

A properly written recursive program, like quicksort, may be used by a beginner, but special care may be necessary.

Programming in all its forms is a great discipline, like mathematics or writing. It would be absurd to pretend that a few articles could properly cover such a subject.

Nevertheless there is great value in something well-started and readers who work out these ideas properly should find them rewarding, and a sound basis for any further development if necessary.

Since computers were invented in the 1940s and became commercially viable in the 1950s, ideas about programming have moved a great deal.

In the decades up to the late 1960s progress was quite considerable, but the 1970s brought the structured programming revolution – the widespread acceptance of a framework of ideas for designing languages and working with them.

A programmer sits awkwardly between two complex worlds: the user's problem or task, and the computer system. The complexity of the task may be inherent and unchangeable but a computer system may be good or bad.

A good one will help the user. A good system will include a good language (or package) which not only copes with good design but also encourages it.

It does this by reflecting in its syntactic forms, faithfully and explicitly, exactly those concepts which are important in the analysis and design stages as well as in the coding.

Thus the programmer is helped to acquire that small but vital common currency of ideas which enhance all the stages of problem-solving with a computer.

A bad language not only fails to help the programmer to write good code. Its wearisome, outmoded confusion often spreads through the programmer's mind, adds to the complexity of the current problem and fails to illuminate future work with the light of good experience.

A good language can be the source of simplifying ideas which make a program understandable, even elegantly simple.

In the 1970s a critical threshold was established for language design. Below this threshold there is no proper conceptual framework – the programmer has to fight complexity on two fronts.

Above it, the language helps the programmer not only to control his medium effectively, but also gives concrete form to the concepts he needs to help him towards a neat resolution of the problems of analysis, design and to a certain extent, documentation.

BBC Basic rests above this threshold, albeit by a narrow margin, but most popular micro-Basics do not. Therein lies the educational importance of BBC Basic.

It is one of the very few widely available versions of Basic which recognise the fundamental advances of the 1970s in the fields of problem solving and programming.

These good versions correct some of the fundamental serious defects of Basic without destroying the equally fundamentally virtues of this old and popular language.

Development continues. SP ideas are very well worked out, but much remains to be done in the areas of data handling and logical inference. Other types of language, such as Prolog, are under development and are highly relevant to these concepts.

The next decade will bring computers which are immensely powerful, portable and, because they will be cheap, plentiful.

Today's computers reflect the intelligence of their designers and software writers. Tomorrow's will take this process of absorbing intelligence to a new order. They will be designed more specifically to do this, and to continue doing it in the hands of their users.

The recent Alvey Report, commissioned by the Department of Industry, calls these fifth generation computers Intelligent Knowledge Based Systems.

If such things come to pass – and it is difficult to see how they might not – the 1970s may be seen as the Iron Age of computing . . . the first real wakening of what may eventually become a genuinely advanced age of information, for better or worse.

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GRAPHICS

Triangular tour that leads us round in circles

THIS month we are going to look at drawing circles on the BBC Micro. It would be nice if we had a CIRCLE command which would allow us to specify the coordinates of the centre of the circle and the radius we want it to be. Unfortunately the BBC Micro does not have such a command.

We can, however, design a general purpose procedure to do it – once we're sure exactly what we want to do and how to do it!

The mathematics behind drawing circles takes a lot of working out, but you don't have to understand the sums to be able to use them effectively.

The secret lies in the use of triangles. Thousands of years ago man found that he could survey land by the technique of triangulation.

Any piece of land could be approximately divided into a set of triangles. You could then measure those triangles and find the total area.

What we're going to do is to divide the circle into triangles, which we can then fill with our PLOT85 command – we'll see exactly how later.

First of all let's look at a particular set of triangles that should help us to do the job properly – right angled triangles.

In them, one of the sides sticks out vertically from the other – a carpenter would say that the two sides are square to one another. Mathematically speaking, the two sides are at 90 degrees to each other – a right angle.

Actually, we've been using right angled triangles throughout these articles to give our X and Y coordinates. The reason you haven't noticed is that we haven't drawn in the third side.

Figure I illustrates the point. The X and Y we use to give us our coordinates are two sides of a right angled triangle.

Notice the following:

- The sides we take as X and Y are the two that are at right angles to each other.
- We mark the fact that they are at right angles with the sign "┌".
- The third side of the triangle is opposite the right angle. We call that side the hypotenuse – though I've labelled it R to make things easier! It is R graphic units long.
- I've marked one of the angles Θ.

The thing about right angled triangles is that if you know what R and Θ are you can easily work out X

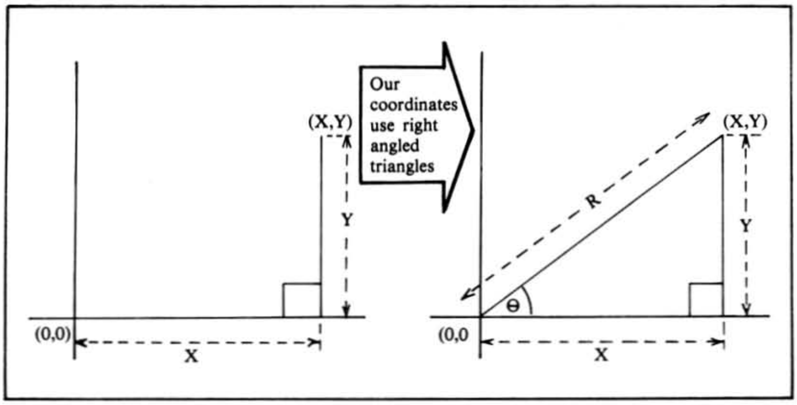


Figure I

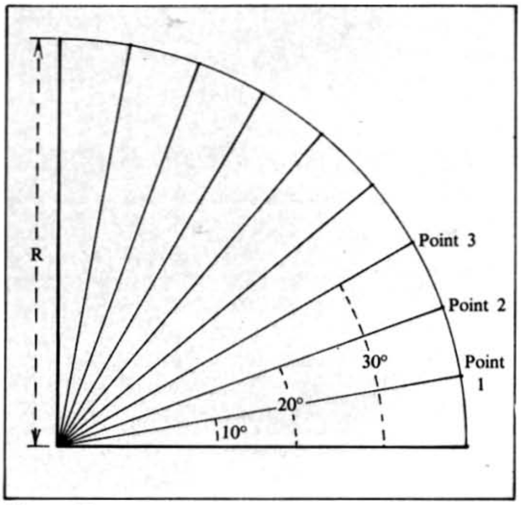


Figure IIa

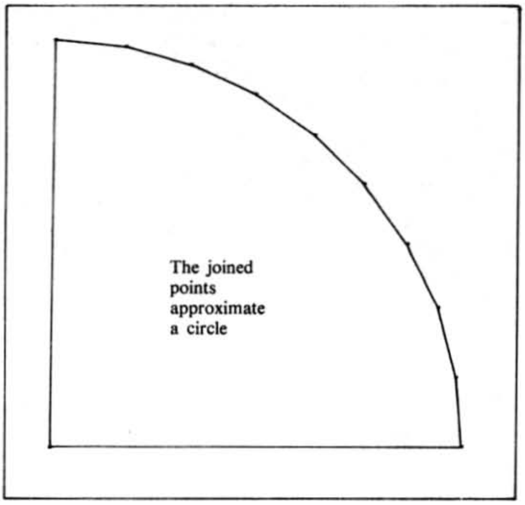


Figure IIb

and Y's values. We use two of BBC Basic's functions, SIN( ) and COS( ).

Then, for any particular R and Θ:

X=R*COS(Θ)
Y=R*SIN(Θ)

Let's not worry exactly how it works, but just put it to work.

The idea is that we can now represent any point on the screen by using either X,Y coordinates – called cartesian coordinates – or by using R and Θ – called polar coordinates.

It happens that we can draw circles more easily thinking in terms of polar coordinates.

The trick is that every point on the circumference, or edge, of the circle is the same distance from the centre – so for a circle R will remain the same length for all its points. That's why we're using R : R for radius.

All we have to do to specify a particular point on the circumference is to give the value of Θ that "points" the radius at it.

Figure II shows how we can use this to draw a quarter circle.

Figure IIa illustrates how we can divide the right angle up into nine steps of 10 degrees.

In our old system of coordinates:

Point 1 is (R*COS(10),R*SIN(10))
Point 2 is (R*COS(10),R*SIN(10))

and so on – ideal for loops that go up in intervals of 10 degrees.

If we join all these points together with straight lines, as in Figure IIb, you can see that the shape we obtain, though not a circle, is fairly close to one.

By PAUL JONES

If we had gone up in steps of five degrees the "fit" would have been even better.

This is how we draw circles. We calculate the points on the circumference using SIN( ) and COS( ), then join them with straight lines.

Provided we choose our values properly, the approximation to a circle is close enough for most purposes.

Program I draws a quarter circle. Here, instead of R we've used radius% and set it equal to 1024 (line 30).

Line 40 initialises the program by moving the graphics cursor out to the circumference of the circle.

Instead of Θ we are using angle% and lines 50-80 form a loop in which angle% increases in steps of 10 degrees.

Unfortunately the BBC Micro measures angles not in degrees, but in radians. To use SIN and COS, the angle must be in radians.

We don't have to worry about this since the micro provides us with a function to convert our usual degrees to radians, RAD( ).

We use this in line 60 to change angle% in degrees to angle in radians.

Note that we cannot use an integer variable for angles expressed in radians – they don't go in nice whole numbers!

The conversion done, line 70 then draws a line to the point specified by that angle.

radius%*COS(angle) corresponds to R*COS(Θ)
radius%*SIN(angle) corresponds to R*SIN(Θ)

Program II again draws a quarter circle, this time filling in the triangles

→

```
   10 REM ***PROGRAM I***
   20 MODE 4
   30 radius%= 1024
   40 MOVE radius%,0
   50 FOR  angle%= 0 TO 90 STEP 10
   60 angle=RAD(angle%)
   70 DRAW radius%*COS(angle),radius%*
SIN(angle)
   80 NEXT
```

Program I

```
   10 REM ***PROGRAM II***
   20 MODE 4
   30 radius%= 1024
   40 MOVE radius%,0
   50 FOR  angle%= 0 TO 90 STEP 10
   60 angle=RAD(angle%)
   70 MOVE 0,0
   80 PLOT 85, radius%*COS(angle),radi
us%*SIN(angle)
   90 NEXT
```

Program II

From Page 47

with PLOT85 (line 80). Notice the move back to the centre (line 70), so that we have three points for our triangle. Leave it out to see what happens.

Perhaps you could alter the program to a four colour mode, and have each triangle plotted in a different colour.

Also, in both programs I and II, the loop variable can start at 10 rather than 0. Can you see why?

Quarter circles are all very well, but how do we manage full circles?

If you cast your mind back once again to schooldays, you might remember that there are 360 degrees in a circle. There are 90 degrees in a quarter circle – a full circle is four times bigger, 360 degrees.

All you have to do is to make the loop variable, angle%, go to 360 instead of 90. SIN( ) and COS( ) automatically take care of things for you.

```
   10 REM ***PROGRAM III***
   20 MODE 4
   30 radius%=512
   40 GCOL0.1
   50 VDU29.640:512:
   60 MOVE radius%,0
   70 FOR angle%=0 TO 360 STEP 10
   80 angle=RAD(angle%)
   90 MOVE0.0
  100 PLOT85,radius%*COS(angle).radius
%*SIN(angle)
  110 NEXT
```

Program III

```
   10 REM ***PROGRAM IV***
   20 MODE 5
   30 FOR radius%=512 TO 512/4 STEP -5
12/4
   40 colour%=colour%+1
   50 PROCcircle(640,512,radius%.colou
r%)
   60 NEXT radius%
   70 END
   80 DEF PROCcircle(xpos%.ypos%.radiu
s%.colour%)
   90 LOCAL angle%.angle
  100 GCOL0.colour%
  110 VDU29.xpos%;ypos%;
  120 MOVE radius%.0
  130 FOR angle%=0 TO 360 STEP 10
  140 angle=RAD(angle%)
  150 MOVE0.0
  160 PLOT85,radius%*COS(angle),radius
%*SIN(angle)
  170 NEXT
  180 VDU29.-xpos%;-ypos%:
  190 ENDPROC
```

Programm IV

Program III illustrates the technique. The actual calculation of points is identical with Program II. We have simply moved the origin to the centre of the screen (line 50), decreased the radius (line 30) and made the high loop parameter 360.

Try altering the coarseness of the circle by changing the value of STEP in line 70. Keep to numbers that go into 360 evenly, such as 15,20,30 and 60.

As you increase the step, which reduces the number of points joined, you will begin to see that what appears as a circle is actually made up of a series of straight lines. Such a figure is known as a polygon.

What value of step gives you the six-sided figure called a hexagon?

Program IV uses PROCcircle, a general circle drawing procedure with the following parameters:

xpos% and ypos% give the coordinates of the centre of the circle.

radius% gives the radius

colour% gives the logical colour number of the circle.

The way the procedure works is identical to Program III, except that at the end of the procedure the graphics origin is moved back to its original position (line 180) – a "tidying up" operation.

The main body of the program (lines 10 to 70) calls the procedure four times for four decreasing radii (line 30).

Could you alter the program to, say Mode 2, and have circles of all the colours?

How about giving the circles different origins?

Finally, can you alter PROCcircle so that it just draws the circumference of the circle?

If you start to draw a circle and as you do so, gradually decrease the radius, what happens?

It's not too hard to see that the edge of the "circle" starts to spiral inwards.

This is the technique we use in Program V . The loop (lines 70-140) repeatedly calculates points on a "circle" (line 100), the radius of which is shrinking as radius% decreases (line 130).

Program VI produces the same spiral but then uses VDU19 to alter the assignments of logical colours so that the colours of the spiral's segments appear to rotate.

After a suitable delay each segment transfers its colour to its neighbour on one side while adopting the colour of its neighbour on the other side. Hence the colours gradually appear to move from segment to segment giving the illusion of rotation.

```
   10 REM ***PROGRAM V***
   20 MODE 2
   30 VDU 29.640:512;
   40 radius%=512:counter%=1
   50 angle%=18
   60 MOVE radius%.0
   70 REPEAT
   80 MOVE 0.0
   90 GCOL0.counter%
  100 PLOT 85.COS(RAD(angle%))*radius%
.SIN(RAD(angle%))*radius%
  110 counter%=counter% MOD 7+1
  120 angle%=angle%+18
  130 radius%=radius%-4
  140 UNTIL radius%<0
```

Program V

You might like to try a similar technique to make waves of colour flow across the circles of Program IV.

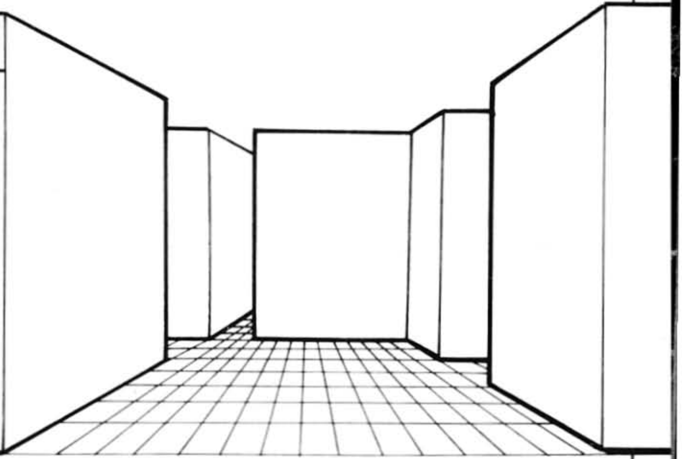
NEXT MONTH we shall delve more into the world of GCOL.

```
   10 REM ***PROGRAM VI***
   20 MODE 2
   30 VDU 29.640:512:
   40 radius%=512:counter%=1
   50 angle%=18
   60 MOVE radius%.0
   70 REPEAT
   80 MOVE 0.0
   90 GCOL0.counter%
  100 PLOT 85.COS(RAD(angle%))*radius%
.SIN(RAD(angle%))*radius%
  110 counter%=counter% MOD 7+1
  120 angle%=angle%+18
  130 radius%=radius%-4
  140 UNTIL radius%<0
  150 REPEAT
  160 FOR loop%=1 TO 7
  170 VDU 19,loop%.(counter%+loop%)MOD
7+1.0,0,0
  180 NEXT loop%
  190 FOR wait%=1 TO 200:NEXT wait%
  200 counter%=counter%+1
  210 UNTIL counter%>200
  220 REPEAT
  230 FOR loop%=1 TO 7
  240 VDU 19.(counter%+loop%)MOD7+1.lo
op%.0,0.0
  250 NEXT loop%
  260 FOR wait%=1 TO 200:NEXT wait%
  270 counter%=counter%+1
  280 UNTIL FALSE
```

Program VI

Star Maze II (Kay Dee Software)

They have maze to take you a walk...



ONE of the things that amazes me about our galaxy is the amount of dishonesty there is about. I mean, someone actually stole the tungstidium jewels from the Emperor of Zxylon.

Anyway he was caught and got what he deserved. He's been put in a 3D maze which has been constructed on a space platform.

By the time he gets out of there he'll have learnt the error of his ways.

Still it's an ill wind that blows no good. The whole episode has given Kay Dee Software the idea for a clever new adventure game called Star Maze II.

The idea is that you are put in the maze and have to find your way out. The screen shows you the view forward and you can use the cursor keys to move forwards, back, left, or right.

Also you have a display telling you which way you are currently facing, the co-ordinates of your position, and, ominously, the amount of energy that you have left.

It's utterly fascinating, and it's all too easy to monopolise the micro while you try to crack the problem. Irritatingly it's one of those games where onlookers feel obliged to give advice.

My advice to them is to go away and buy their own copy of Star Maze II. They won't regret it. **Jean Clarke**

Wordhang (Bourne Educational Software)

Spelling in suspended animation

THIS version of the well-known Hangman word guessing game is a colourful and fun way of testing and expanding vocabulary and spelling.

It is particularly useful for a teaching environment because it allows a wide degree of supervisory control by the teacher or parent.

Specific lists of words can be used, words can be entered one by one, a group of words suitable for a particular topic or age group can be selected, time limits for guessing a letter may be set, and the progress of children using the program monitored.

The program is both easy and eye-catching to use. First of all the child is asked to enter his name, and then for each word to be guessed he is prompted to suggest possible letters to make up the word which the BBC Micro is thinking of.

Each correctly suggested letter is shown in its position in the word, but if an incorrect letter is entered or if no entry is made within the time limit allowed then part of the "hang-man" appears on the screen.

If the word is not guessed before he is complete then the body swings up and down, his face turns gruesomely purple and the word is displayed in full.

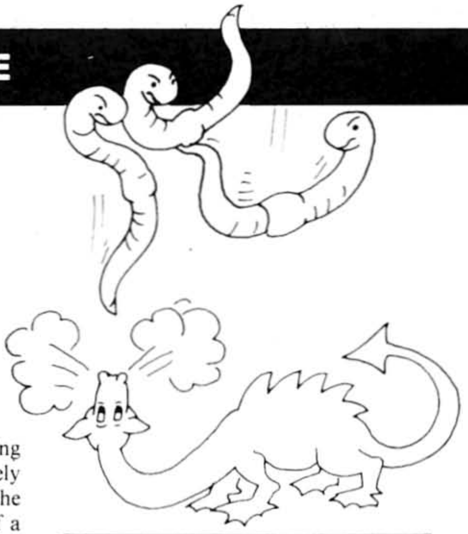
The lists of words given on the tape include six different topic groups, each divided into six average reading age groups from seven to 12 years. The topics include history, geography, maths, transport and sport.

In addition to these, the utility Wordstore allows you to edit and store new lists of words to fit particular learning requirements. These lists are easily accessed by the main menu driven program.

This is a useful and effective implementation of a traditional learning game which can be adapted for a wide range of learning ages and abilities.

Jane Jackson

Now it's alien worms



Dragon Rider (Salamander)

JUST looking at this game's packaging made me want to buy it. It's a lovely little plastic case just larger than the cassette with an attractive picture of a dragon on the outside.

But, as my mother always used to say, never mind the packaging, take a look what's inside.

Well I have, and it lives up to expectations.

The theme of Dragon Rider is that you're on a planet threatened by showers of alien worms falling from the sky. If you've read any of Anne McCaffrey's excellent science fiction books you'll know where the idea came from.

Your aim is to destroy the worms before they reach the ground, and to this end you use your trusty dragon.

As you might expect you can scorch the worms with the dragon's breath, but this uses up rather a lot of energy. Alternatively you can use your laser lance which has less effect but saves energy.

When you destroy one cluster of the falling pests another, more testing one arrives.

Yes, I know what you're thinking – and you're right, it is another variant of Space Invaders – but it does have its original points.

Your laser base has become a dragon which actually flies up into the showers.

Another difference is that you can't fire at the worms from below, you have to move so that you can shoot at them from the side. This adds a whole new dimension.

And you have to watch the energy level of your Dragon, as indicated by the poor beast's colour.

Hits from the worms, using your weapons and, in the higher levels, the energy used in manoeuvring, all deplete your reserves.

To avoid crashing you have to eat one of the firestones found on the valley floor.

All this makes the game quite different, and its adequate instructions and easily-used keyboard controls make it simple to learn.

The graphics are high quality and the whole idea works well. Don't be fooled by the seeming lack of speed at first. You'll soon find it goes fast enough!

If you're looking for a zap-pow game that has all the attractions of Space Invaders plus a lot more then Dragon Rider deserves serious consideration.

It's different and it's fun.

Canyon (BBC Soft)

DURING the war the Mediterranean island of Malta found itself under attack from wave after wave of German planes.

In those troubled times all the island had in the way of air defence were three ancient Gloster Gladiators. They became known as Faith, Hope and Charity for reasons you might guess.

Now you can relive the situation in BBC Soft's excellent new game Canyon.

As one of the defenders of the embattled state of Asdel you only have three biplanes to repel the unwarranted aggression of your warlike neighbour of Xar.

On their side they have fighter bombers, missile boats, mines and rather unpleasant giant flame throwers. In

The skill shapers

Junior Maths Pack (Program Power)

HERE is a set of three good programs for helping with basic maths skills.

The first, Lander, is a fast-reflex test of skills at multiplication and division. You choose which you want to try and then must keep furiously typing in the correct answers to the problems which flash up on the screen.

Success determines whether or not the alien lander will make it to the Earth.

Every calculation you get right gives it a boost away from landing, but if you don't answer fast enough or you get the answer wrong then the lander gets nearer and nearer, eventually reaching the ground.

You can choose how hard to make this game by selecting tables, 2, 5 and 10, up to 5, up to 10 or up to 12.

Also you can select the speed of the attack, from 1 (this is impossible) to 5 (this is still pretty tough for those of us who use calculators usually for adding 2+2).

The second program, Treasure Search, tests coordinates and direction.

You have to try to find an object hidden in a grid of boxes by a wizard. When you find one he hides another, until after four successes he gives up and goes off to haunt another computer.

To look in any box you give the X coordinate (1 to 10) and the Y coordinate (1 to 20). If there's nothing in that box, an arrow points towards a box with something in it.

You can choose to either have the arrows remain on the screen or not.

Every time you find an object, which might be an emerald if you're lucky or just an old bone, you're told how many

Faith, Hope and Charity take to the skies again

other words, overwhelmingly superior forces.

In essence it's just a version of the old arcade game where you journey from left to right along a tunnel avoiding obstacles on the way.

This time you are travelling from top to bottom of the screen along one of a series of 24 canyons. These progressively get more difficult to negotiate and become more heavily defended.

The Xarian forces come at you thick and fast and the game becomes a test of reactions and nerve. You can nearly always avoid a Xarian opponent but you lose points if he gets by.

The one thing in your favour is that the enemy fleet and their accompanying aircraft have to attack Asdel via a series of narrow canyons. This makes them easy pickings if you are quick enough.

The problem is that the canyon walls are high and irregular and the islands in the middle of the river have mountains just waiting for you to hit them.

Of course the Xarians, with their advanced technology, aren't worried by the obstacles but you in your little radar-less plane with its one pitiful cannon are all too vulnerable.

The controls are simple to use and well explained. You can choose the speed of the game, the number of the enemy you meet and the width of the canyon you fly down, each having four levels of difficulty. This allows you to match the game conditions to suit each player.

If you find the going too hard you can always stop the game and start again with new difficulty factors. There are also three special practice games to help you improve your skills.

Can you get through the enemy fleet, thwart his attack and eventually reach Xar itself, there to be met by the Final Question?

Well you might be able to, but I certainly can't – though as soon as I've finished writing this I'll be back trying.

The game is fascinating. The graphics are good, the instructions excellent (you get an instructive little booklet) and the whole thing is a pleasure.

Pete Bibby

tries it took and the time involved.

This is a fun way of consolidating ideas about coordinates, as well as general spatial relations.

Third in the set is Number Spin, an action packed fruit machine to help with subtraction and addition practice.

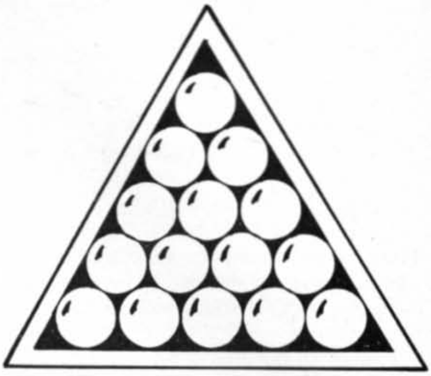
You can select the speed of the game and the highest number you want from 10 to 999.

Then the three wheels spin and in true arcade style you get features like "hold" lights (which let you keep the value of that reel fixed), and "nudge" which you use to add or subtract values to the reels to try to get the first two reels or all three matching.

The sound effects are great, and it is a fun way of learning, without the tedium of endless pages of arithmetic practice.

This is a good example of the type of quality software which the BBC Micro deserves, and should easily find a place in schools and homes.

Jane Jackson



Snooker (Acornsoft)

AFTER Steve Davis has been playing locally, trying to get on a snooker table in town is like attempting to spot the needle in the haystack, only less fun.

Happily I don't need one because I've got a copy of Acornsoft's excellent version of snooker.

Having said that, I must admit that when I first got the game to review I took one look at the instructions and decided that I'd need a maths degree to understand them, let alone play the game.

However, when I actually got down to figuring them out I found that they were well written and much easier to understand than appeared at first glance.

And the game itself was a pleasure to play, being an accurate simulation of the real thing.

All the normal rules of snooker are followed and the balls behave with maddening realism.

You use the keyboard to draw the cue (its length determining the power and direction of the shot) and you can choose between normal shots, top spin, and back spin.

Despite first appearances, the controls quickly become second nature and you are left to concentrate on the game itself.

Nice and gentle, this soon becomes subtly fascinating with all the joys and frustrations you'll find on a real table.

It's one you want to play again in the hope that you've improved with practice. And I have.

If Steve Davis would only condescend to play on a TV screen instead of the green baize I might stand a chance of snooker glory.

Nigel Peters

When a good idea produces fine software

Animal/vegetable/mineral (Bourne Educational Software)

THIS is a good computer adaptation of a learning game which can be fascinating to use both for young and old BBC Micro users.

First of all the user is asked to enter their name, and then to think of an object for the computer to guess.

When you have thought of your object the computer asks if it is animal, vegetable or mineral. Suppose you had thought of a cat, then the response here would be animal.

Being a fairly smart computer the next question you are asked is: "Has it got four legs?" In this case you would say yes, and the computer thinks for a moment and then asks: "Is it a cow?".

This is because until you have taught the computer a few more facts about the world, the only four legged animal it knows about is a cow. So it gives up guessing when you say "No", and asks you instead what animal you were thinking of.

Now for the tricky part! The computer rather sweetly asks "Now please type in a question that would tell the difference between the following: Cat – Cow".

Just when you are feeling that you have outwitted the stupid machine you have to think of a good difference between the two objects.

For example, "Does it live outside?" and "Can you keep it as a pet?" could have debatable answers! In this case you could settle for: "Does it purr?"

The computer responds with "Thanks for teaching me more", and tells you how many animals, vegetables and minerals it knows of now.

If you have another go, and think of another animal the computer will ask first, "Has it got four legs?" then if you say yes will ask, "Does it purr?".

From here it again builds up a store of knowledge about objects and significant differences between them, which after a few goes develops into an appealingly interesting exercise.

The computer gradually learns more and more about the objects and challenges you to increasingly more subtle depths of thinking about them.

The program allows you to save questions and objects too, so that all your hard thinking from one session can be used again without beginning from scratch.

This is one of those rare programs which takes a good simple idea and translates it into an equally good and easy to use piece of software.

Jane Jackson

Expertise isn't always enough..

Starship Command (Acornsoft)

I'VE come to realise that games seem to interest two types of people. The first, and more numerous, only want to play the game and enjoy it.

The second want to know how it works and, probably, how to copy it. (I hasten to add that they only want to make a back-up copy!)

I thought of this when I got Acornsoft's Starship Command to review. A friend of mine who is much more knowledgable in the ways of the BBC Micro than I had told me of this "fantastic" new game from Acorn.

So it was with feelings of pleasant anticipation that I loaded it into my micro. Sadly, I was disappointed.

Not that it's a bad game. On the contrary it's a very good version of an old favourite. You know the one – you're a starship captain cruising through deep space tangling with alien nasties.

Well-packaged, with excellent instructions – both on paper and in software – it's an example of what a game should be. But it's also a bit boring.

I got on to my friend and told him what I thought. I said the scenario was good, but wasn't it just Meteors with enemy ships instead of interstellar rocks?

He was appalled and told me I'd missed the point. The game was brilliant.

Hadn't I noticed that my ship stayed still in the centre of the screen and when I turned it was the enemy ships that "moved" relative to me? How do Acorn do that? he asked.

Well I don't know and to be quite frank I don't care because I belong to the first group of games enthusiasts.

I just want an interesting, exciting game to play. And I'm afraid that despite the obvious expertise that went into it, Starship Command just does not fit the bill.

A lot of effort seems to have gone into producing a very ordinary game. Disappointing.

Nigel Peters

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THE MICRO USER

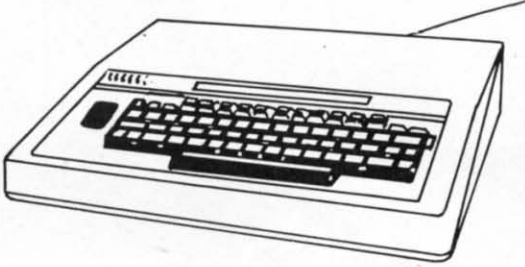
September issue
Animation Part II. Editing course: use of the TAB statement. Turn your BBC Micro into a graphics terminal. Galactic Invaders listing. Structured programming, Part V. Two new DFS and APTL Eprom blower reviewed. Control the outside world safely with your BBC Micro. Robin and Marian listing. Workshop: variable storage explained. Beebcalc investigated. Inside the Electron. Guide to Software for the BBC Micro.

IN this article PAUL BEVERLEY shows how two BBC Micros can be linked interactively, offering tremendous possibilities to the programmer – not least in the field of games software.

For example, you could "fly" a Sopwith Camel on your micro while your opponent uses his machine to attack you with his Fokker Triplane.

If YOU want to become involved in this new style of programming drop us a line describing the form your program will take. The address is: Link Up, The Micro User, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

PAUL BEVERLEY
a couple of BBC
interesting



Two
have a

HAVING looked last month at the way in which the BBC Micro could be linked to a mainframe computer by using the RS423 Serial Port, we now look at the idea of linking two BBC Micros by using the same RS423 port.

In linking up to a mainframe computer the idea was to make use of the processing power of the mainframe and the colour graphics facility of the BBC Micro.

What, then, is the point of linking two BBC Micros? First of all, it is possible to do the same sort of thing as we were doing with the mainframe.

The idea is that the second BBC does the calculations, while the first one concentrates on drawing the graphics. The machine doing the calculations can then work in mode 7 and therefore have its full memory capacity for the program and data storage.

However, the same effect could be achieved much more easily, cheaply and efficiently by using a single BBC Micro linked to a second processor.

Nevertheless, if you do have access to a second machine then it would be quite easy, using the routines provided in this article, to run an applications program needing, perhaps, 28k of RAM and yet work in modes 0, 1 or 2.

A second possible use of a BBC-to-BBC link is for down-loading software. If you have a number of cassette machines and a single disc machine, then for the cost of a couple of five pin DIN plugs and a few metres of four-core screened cable, you have the facility for sending programs at fairly high speed down from the disc system to the cassette systems.

For example, a 15k program can be down-loaded in approximately 25 seconds. Figure I shows the way in which the cable should be made up using the RS423 DIN connectors.

The easiest way to achieve this is to have a key on the receiving microcomputer programmed as:

```
*KEY0NEW¦M*F2,1¦M
```

and one on the sending microcomputer programmed as:

```
*KEY9*FX3,7¦MLIST¦M*FX3,0¦M.
```

It would be possible to increase the baud rate of the two RS423 interfaces to 19200 baud instead of the default value of 9600, but it makes very little difference since the speed is limited by the rate at which the Basic interpreter on the receiving machine can store the program. On a 15k program it made a difference of only one second.

The problem with this is that it is only a one-to-one transfer. Ideally, it should be capable of a "broadcast"

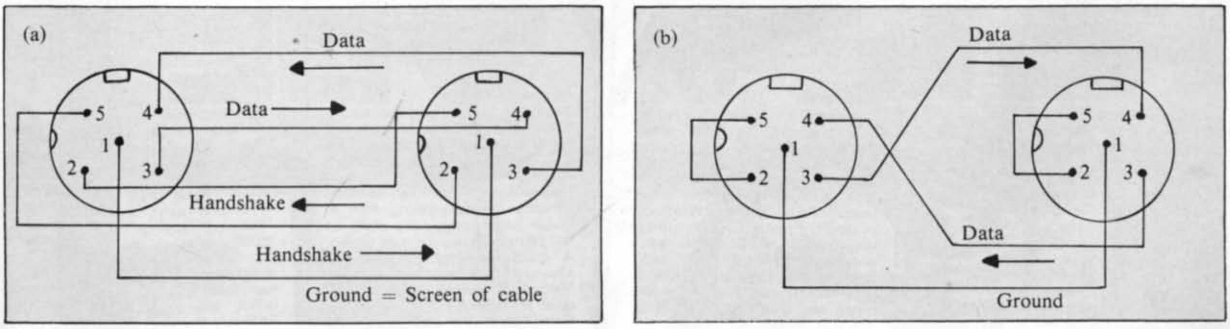


Figure I: How to connect up the two RS423 connectors
(a) Including the handshake lines for full speed communication (b) Without the handshake lines

shows how to link Micros to write interactive games

can party...

system so that several micros could receive programs from the one disc-based computer at the same time.

The problems with this are, first of all, that one RS423 driver might not be capable of driving a number of RS423 receivers, and secondly that hand-shaking would be difficult to achieve because a number of devices would be trying to control the output of one machine.

It would probably be best to do away with hand-shaking altogether and work at a lower baud rate. At each station then, the RTS and CTS should be linked together as a way of ensuring that it is always "clear to send". (See Figure Ib.)

As far as the baud rate setting is concerned, this is done by using *FX7 for the receive rate and *FX8 for the sending rate, as explained on page 424 of the User Guide.

These rates, once set, are only changed back to the default values by a hard break and not by a soft break, so there is no need to program a key to give the correct receiving speed.

This is all very interesting and exciting for the educational user. But what is probably more interesting to a larger number of people is the idea that since, when two computers are linked via the RS423, each has the capability of drawing or writing on the other's screen, you could play interactive games with two computers.

You can either have the two computers playing one another or two operators at the two computers playing a game against each other.

An obvious example would be the well known game of Battleships. The two players would sit with their computers back to back so that neither could see the VDU of the other. The moves could be made on each computer and the bombs could be dropped by sending them down the RS423 (not literally!).

In this present article, all I shall do is to give a series of procedures which you could incorporate into your own games programs. I am sure that if some of you write some good programs the editor will be pleased to publish the best of them.

Before explaining in detail the procedures for linking the two micros let us look at the way in which the RS423 actually works so that you may understand better how the communication takes place.

As I explained last month, the BBC Micro has three separate buffers which are used for storing characters as they enter and leave the computer. There is one on each of the RS423 input and output, and also one on the keyboard.

If someone presses a key, this interrupts the processor, which responds by scanning the keyboard to find out which key has been pressed. It then puts the Ascii code of the character into the keyboard buffer.

When characters are received on the RS423 input, again the processor is interrupted and the characters are placed in the RS423 input buffer.

When the processor wants to send some characters out onto the RS423, they are simply placed in the RS423 output buffer so that as soon as the ACIA (Asychronous Communications Interface Adaptor) has sent out one character, it interrupts the processor which responds by looking in the RS423 output buffer for a further character to send out.

Software control of the RS423 input and output is achieved by using FX calls 2 and 3. The first deals with input, the second with output.

As far as the input is concerned there are only three values which are used.

***FX2,0** – This completely disables the RS423 input (and NOT enables it, as the User Guide says), and allows input to come only from the keyboard. In other words, if the ACIA receives any incoming characters it does NOT interrupt the processor and the characters are NOT stored in the RS423 input buffer.

***FX2,1** – This causes input to be taken only from the RS423 input buffer so that any command like INPUT, GET, GET$, INKEY or INKEY$ only looks at the RS423 buffer for its input. At the same time if keys are pressed, the characters produced are placed in the keyboard buffer, although they are not accepted by any of the input commands.

***FX2,2** – This works in exactly the opposite way to 2,1 in that characters are taken in only from the keyboard buffer, but if any characters arrive on the RS423 input they are placed into the RS423 input buffer and can be looked at later when a *FX2,1 is executed.

As I explained last month, any of the graphics commands such as PLOT, DRAW, GCOL, COLOUR, etc can be

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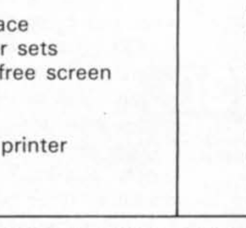

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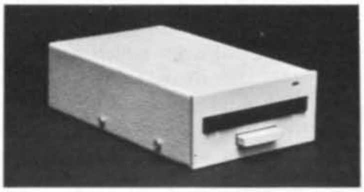

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interpreted as a sequence of numbers which are simply sent to the operating system software. These strings of characters could come directly from the keyboard or from a program, or they could come from the RS423 input.

The only problem is that if you do not complete a sequence of characters for a particular command, and then receive some characters from a different source, then the two sets of commands, having been mixed up, will produce all sorts of spurious effects.

Therefore, it is important in any software using the RS423 input for graphics that you should be careful to complete each command before switching from the RS423 back to the keyboard.

That is probably why Acorn have not made it possible with the current FX commands to enable both of the RS423 and keyboard inputs at the same time. If this were done then commands from the keyboard and from the RS423 would be interleaved, causing complete chaos.

*FX3 is used to select which of the three possible output channels are used when the processor wants to send out characters. The three channels are:

1. The printer
2. The VDU
3. The RS423 output

In the *FX3 command, the number which is used is made up of three binary bits, each one representing one of the three output channels, and whether that channel is selected or not depends on the state of the binary bit, either one or zero.

It is further complicated by the fact that the RS423 channel uses logic 1 to indicate that it is on, whereas the other two use logic 0 to indicate that they are on. Therefore the best thing to do is simply to look at the table on page 422 of the manual to decide which number to use for any particular combination of outputs.

Unfortunately, there is a further complication. Certain of these commands do not seem to work properly in the 1.2 operating system. Acorn tell us that *FX3,2 does not work properly, and Beebug assure us that it is *FX3,3 which does not work properly. Various other sources indicate that the fourth bit of the binary number, not mentioned in the User Guide, can also be used in order to control what happens, although again no one is really sure quite what it does.

As far as this present task of communicating via the RS423 with another BBC is concerned the problem is very simple. All you need to use is *FX3,0 if you simply want to output characters to the screen, *FX3,7 if you want to output characters to the RS423 and not to the screen, and finally, if you want to send them out to both, use *FX3,1.

If someone has the time to sort through which of these various *FX3 commands does what, I – and probably various others – would be extremely pleased. But, as far as I can see, the only problem that occurs is when you try to get the printer enabled and not the VDU. This would account for the problems occurring with both *FX3,2 and 3,3.

It seems that the printer driver routines operate THROUGH the VDU routines and therefore if you disable the VDU routines you disable the printer driver, but don't quote me on that. I may be wrong.

If you want printer only and not the VDU then try:

VDU 2,21 :REM switch printer ON,
screen OFF:PRINT whatever
VDU 3,6. :REM switch printer OFF,
screen ON.

If you look at Figure II you will see a sample program containing the various procedures which you could use in order to write various communications programs. If this program is loaded into two separate computers linked by an appropriate cable, then each computer will draw a pattern on the other computer's screen.

If you want a more impressive demonstration, then while this program is running on one computer, run the program given in Figure III on the other. While the first computer draws the pattern on the other's screen, anything typed into the keyboard of the second computer comes out on the screen of the first computer!

Not all of the procedures in this program are actually being used but have been included so that you can see what is possible. Let us look, therefore, at the procedures given in Figure II in the order in which they occur in the list of DEFPROCs.

The first job which has to be done is to enable the RS423 input buffer using *FX2,2. You then need to disable the escape codes by using *FX229,1.

The reason for this is that otherwise, any command which contains the number 27 (escape code) will not be executed properly since the 27 is taken as an actual escape, and the character will not be stored in the RS423 buffer.

```
    0 PROCinitialise
   10 MODE 1
   20 REPEAT
   30 PROCreceive
   35 C%=INKEY (0)
   36 *FX3,7
   37 IF C%>0 VDU 1,C%
   38 *FX3,0
   40 UNTIL 0
   50
20000 DEF PROCinitialise
20010 *FX2,2
20020 *FX229,1
20025 *FX7,8
20026 *FX8,8
20030 ENDPROC
20040
20050 DEF PROCreceive
20060 *FX2,1
20070 N%=INKEY (0)
20080 IF N%=-1 GOTO 20120
20090 FOR CHARS=1 TO N%
20100 PRINT GET$ ;
20110 NEXT
20120 *FX2,2
20130 ENDPROC
20140
```

Figure III: A program to allow text and graphics to be sent in from the other computer while sending out any characters typed into the keyboard back to the first computer.

This does mean that having done a *FX229,1 you cannot escape from any programs by pressing the escape key, but you can always press BREAK and perhaps have the BREAK key programmed with an OLD command.

Each of the commands which is sent out using one of the procedures from line 20170 onwards is preceded by a number which indicates how many characters there are in the particular command.

The idea is that when receiving characters you want first of all to look and see whether any characters have arrived at all (this is done at line 20090 using the INKEY command). If so you then want to wait until all of the characters which make up the complete command have arrived.

If you do not do this, then the receiv-

→

```
    0 PROCinitialise
   10 MODE 1
   20 PROCvdu(5)
   30 PROCgraphics_origin(640,512)
   40 REPEAT
   50 FOR S%=20 TO 500 STEP 40
   60 PROCgcol(3,RND(3))
   70 PROCcolchange(RND(3),RND(8)-1)
   80 FOR X%=-S% TO S% STEP 8
   90 PROCmove(-S%,X%)
      :PROCdraw(S%,-X%)
  100 PROCmove(X%,-S%)
      :PROCdraw(-X%,S%)
  105 IF INKEY 0>0 REPEAT PROCreceive
      :UNTIL INKEY 0>0
  110 NEXT X%
  120 PROCreceive
  130 IF INKEY 0>0 REPEAT PROCreceive
      :UNTIL INKEY 0>0
  140 NEXT S%
  150 UNTIL 0
  160 END
  170
20000 DEF PROCinitialise
20010 *FX2,2
20020 *FX229,1
20030 *FX7,8
20040 *FX8,8
20050 ENDPROC
20060
20070 DEF PROCreceive
20080 *FX2,1
20090 N%=INKEY (0)
20100 IF N%=-1 GOTO 20140
20110 FOR CHARS=1 TO N%
20120 PRINT GET$ ;
20130 NEXT
20140 *FX2,2
20150 ENDPROC
20160
20170 DEF PROCdraw(X%,Y%)
20180 *FX3,7
20190 VDU 6
20200 DRAW X%,Y%
20210 *FX3,0
20220 PROCreceive
20230 ENDPROC
20240
20250 DEF PROCmove(X%,Y%)
20260 *FX3,7
20270 VDU 6
20280 MOVE X%,Y%
20290 *FX3,0
20300 PROCreceive
20310 ENDPROC
20320
20330 DEF PROCprint_tab(X%,Y%,P$)
20340 *FX3,7
20350 VDU (3+LEN (P$))
20360 PRINT TAB(X%,Y%)P$;
20370 *FX3,0
20380 ENDPROC
20390
20400 DEF PROCcrlf
20410 *FX3,7
20420 VDU 2,10,13
20430 *FX3,0
20440 ENDPROC
20450
20460 DEF PROCmode(X%)
20470 *FX3,7
20480 VDU 2,22,X%
20490 *FX3,0
20500 ENDPROC
20510
20520 DEF PROCplot(T%,X%,Y%)
20530 *FX3,7
20540 VDU 6
20550 PLOT T%,X%,Y%
20560 *FX3,0
20570 PROCreceive
20580 ENDPROC
20590
20600 DEF PROCcolour(X%)
20610 *FX3,7
20620 VDU 2
20630 COLOUR X%
20640 *FX3,0
20650 ENDPROC
20660
20670 DEF PROCgcol(X%,Y%)
20680 *FX3,7
20690 VDU 3
20700 GCOL X%,Y%
20710 *FX3,0
20720 ENDPROC
20730
20740 DEF PROCcolchange(L%,A%)
20750 *FX3,7
20760 VDU 6,19,L%,A%,0,0,0
20770 *FX3,0
20780 ENDPROC
20790
20800 DEF PROCup
20810 *FX3,7
20820 VDU 1,11
20830 *FX3,0
20840 ENDPROC
20850
20860 DEF PROCdown
20870 *FX3,7
20880 VDU 1,10
20890 *FX3,0
20900 ENDPROC
20910
20920 DEF PROCleft
20930 *FX3,7
20940 VDU 1,8
20950 *FX3,0
20960 ENDPROC
20980 DEF PROCright
20990 *FX3,7
21000 VDU 1,9
21010 *FX3,0
21020 ENDPROC
21030
21040 DEF PROCtextwindow(X1%,Y1%,X2%
      ,Y2%)
21050 *FX3,7
21060 VDU 5,28,X1%,Y1%,X2%,Y2%
21070 *FX3,0
21080 ENDPROC
21090
21100 DEF PROCgraphicswindow(X1%,Y1%
      ,X2%,Y2%)
21110 *FX3,7
21120 VDU 9,24,X1%;Y1%;X2%;Y2%;
21130 *FX3,0
21140 ENDPROC
21150
21160 DEF PROCbeep
21170 *FX3,7
21180 VDU 1,7
21190 *FX3,0
21200 ENDPROC
21210
21220 DEF PROCcls
21230 *FX3,7
21240 VDU 1
21250 CLS
21260 *FX3,0
21270 ENDPROC
21280
21290 DEF PROCclg
21300 *FX3,7
21310 VDU 1
21320 CLG
21330 *FX3,0
21340 ENDPROC
21350
21360 DEF PROCgraphics_origin(X%,Y%)
21370 *FX3,7
21380 VDU 5,29,X%;Y%;
21390 *FX3,0
21400 ENDPROC
21410
21420 DEF PROCdelete
21430 *FX3,7
21440 VDU 1,127
21450 *FX3,0
21460 ENDPROC
21470
21480 DEF PROChome
21490 *FX3,7
21500 VDU 1,30
21510 *FX3,0
21520 ENDPROC
21530
21540 DEF PROCvdu(N%)
21550 *FX3,7
21560 VDU 1,N%
21570 *FX3,0
21580 ENDPROC
```

Figure II: A version of Persian written to run on the computer on the other end of the RS423 connector. Pressing any key will cause the generation of the pattern to halt at the end of a segment. Pressing again will restart it.

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From Page 59

ing routine, when it is executed, will pick up only those characters which have already arrived in the RS423 input buffer.

If some of the characters for the current command have not yet arrived, then the procedure will end without having completed the command. Any characters subsequently sent to the VDU routines from the machine itself will be interpreted as the data for that particular command.

Therefore, the receive routine waits for all of the characters by using the GET$ command. Having received all of the characters for the particular command, the input is then returned to the normal keyboard input by using the *FX2,2.

It is important to realise that if you do not have sufficient receive routines in your program then the output buffer in the sending micro will become full, thus effectively stalling the processor.

This means that it is not executing any receive routines either, and therefore the output buffer in the other machine will soon fill up.

This can be detected by the fact that both displays lock up and the shiftlock lights are on (both machines).

The remaining procedures are fairly self-explanatory, as the same names have been used for the procedures as for the original Basic commands.

For example, to draw on the opponent's screen a line to the co-ordinate 1000,1000 all you have to do is to say PROCdraw(1000,1000). The same idea is true with moving and plotting.

If you want to change the colour, either of text or graphics, on the opponent's screen, then the procedures "colour", "gcol" and "colchange" are available.

You can also set up text and graphics windows in the opponent's screen and clear either the text or the graphics screens.

You can change the graphics origin. You can delete characters. You can home the text cursor. You can make his computer "beep" and can move the cursor in each of the four directions.

There is also a command which enables you to send out single VDU commands, such as VDU20, in order to restore the default logical colours.

If you want to print characters onto the opponent's screen then there are three procedures for this.

The first allows you to print at a specific location on the screen – the "print tab" command. Then you can print single strings using the PRINT command, and finally there is the "crlf" command, which allows you to produce a carriage return and a line feed.

It is necessary to send out both the carriage return and line feed since the auto line feed facility does not work when the characters are coming in from the RS423 input.

The procedures are there ready for you to use to write your own programs. The possibilities are endless. The only limit is on the amount of programming time that you have available.

If you want to start writing high speed interactive graphics programs for two computers, you will need to have the equivalents of these Basic procedures written as assembly language programs, and for full speed they will need to run as interrupt routines. But that's another story.

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The BBC's Ceefax service has already started broadcasting such programs, called telesoftware, which the lucky winner will be able to download for free!

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The winner of June's competition, to devise a chess board for the BBC Micro, was Mr D. Hubbard, of Welwyn Garden City. He wins a trip for two to Hong Kong.

We publish below Mr Hubbard's description of his program, followed by the winning listing.

And here's the winning Chessboard - by its writer

THE program displays a chess board with all 32 pieces in their starting positions using a perspective view and highlights to give a suggestion of depth and realism.

Use is made of the facility for overlaying graphics characters as the picture is built up. Graphics mode 1 has been chosen because it gives equal resolution in the vertical and horizontal directions with 256 pixels available vertically and 320 horizontally. This mode also permits the use of four colours.

PROCget_ready performs initialisation. The text cursor is combined with the graphics cursor (VDU 5). This also permits overlaying of graphics characters.

Logical colour 1 is then reset to cyan and selected for the background. CLG clears the screen to this colour.

The logical colours for the chess pieces are then set up as integer variables Black% and White%. (Yellow is used as the actual colour for the white pieces to produce sufficient contrast.)

The chess board is drawn by **PROCdraw_board** which first defines the characters required to display one square.

There are three rows of five characters for each square defined in such a way that an oblique shape can be drawn.

The eight rows of the board are drawn by calling **PROCdraw_row** with the coordinates for the start of each row.

PROCdraw_row first exchanges the foreground colour because the rows start alternately with a black or a white square.

The exchange algorithm is: $C_{n+1} = (A+B) - C_n$ which causes C to alternate between A and B (provided the initial value of C is either A or B).

The variable **Fgnd%** is alternated between 0 (black) and 3 (white) at line 4030.

The row of eight squares is drawn by calling **PROCdraw_square** with the appropriate starting coordinates for each square.

PROCdraw_square selects the required foreground colour (line 5030) and then alternates **Fgnd%** ready for the next square.

The cursor is moved to the specified origin and the three rows of defined characters are printed.

My entry for the limerick contest is:

There was a young man with a Beeb,

____

____

____

____

Name ....

Address ....

....

....

Tel. No.........................

Post to: Limerick Contest,
Micro User, Europa House, 68
Chester Road, Hazel Grove,
Stockport SK7 5NY.

Back spaces (8) and a line feed (10) are used for re-positioning between rows.

Having produced the chess board the major black pieces are then drawn. **PROCdraw_pieces** is called with parameters selecting the colour and starting coordinates. These parameters become globally available to the individual piece procedures (lines 6020-6090).

A standard format has been used for the pieces to simplify the drawing procedure. Each piece fits into a matrix of 10 characters (two wide by five high) and is defined in three stages.

First is the main shape, which will be drawn in the colour of the piece.

Next are highlights, which only occupy the right hand half of the matrix. These are always drawn in white.

Finally, an outline is defined which will be drawn in cyan around the main shape to improve the contrast.

The procedures rook, knight, and bishop all follow the same pattern.

First **PROCclear** is called to produce null characters. This is because these three pieces are shorter than the king and queen and do not occupy the full 2 x 5 matrix.

Next follow the character definitions for the main shape, the highlights and the outline. The piece is plotted by **PROCdraw_piece.**

The procedures for king and queen first define the characters for the top part of each piece and then call a common **PROCroyal_base** which defines the remaining six character block. **PROCdraw_piece** completes the process.

PROCdraw_piece sets the main colour and moves to the start position. It then prints the 10 characters giving the main shape. Backspaces and linefeeds are used to re-position for each row.

Next, the colour is changed to white and the cursor is moved back to the origin ready for the five characters displaying the highlights.

A tab character (9) moves the cursor from the origin one space to the right before printing this column.

The colour is then changed to cyan and the 10 characters for the outline are printed. Before ending this procedure the coordinates are adjusted to the starting position of the next piece.

Having drawn the major black pieces, the main program now calls **PROCdef_pawn** to set up the characters for a pawn.

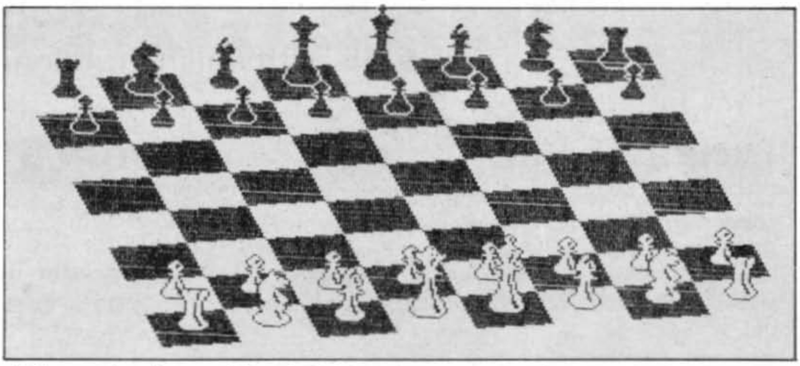
The pawns use a matrix of 2 x 3 characters which are defined for main shape, highlights and outline in a similar manner to the major pieces.

The main program sets the initial coordinates for the row of black pawns and zeroes the count of **pawns_drawn.** It then repeats the procedure to draw a black pawn until eight have been drawn.

PROCdraw_pawn is very similar to **draw_piece** except that it uses a smaller matrix. Before ending it adjusts the coordinates ready for the next pawn and also increments the count of **pawns_drawn.**

The main program continues in a similar way to draw the white pawns and then the white pieces.

Finally, the cursor is moved to the graphics origin so that the prompt does not appear when the program terminates.



A dot matrix printout of the winning entry

CHESS LISTING

```
1000 MODE 1
1010 PROCget_ready
1020 PROCdraw_board
1030 PROCdraw_pieces(Black%,48,800)
1040 PROCdef_pawn
1050 OrigX%=80
     : OrigY%=672
1060 pawns_drawn=0
1070 REPEAT
1080 PROCdraw_pawn(Black%)
1090 UNTIL pawns_drawn=8
1100 OrigX%=240
     : OrigY%=352
1110 pawns_drawn=0
1120 REPEAT
1130 PROCdraw_pawn(White%)
1140 UNTIL pawns_drawn=8
1150 PROCdraw_pieces(White%,272,352)
1160 MOVE 0,0
1170 END
1180 REM
2000 REM *** INITIALISATION ***
2010 DEF PROCget_ready
2020 VDU 5
2030 VDU 19,1,6,0,0,0
2040 GCOL 0,129
2050 CLG
2060 Black%=0
2070 White%=2
2080 ENDPROC
2090 REM
3000 REM *** DRAW THE CHESS-BOARD
      ***
3010 DEF PROCdraw_board
3020 REM character definitions:
3030 REM 5 characters for top row
3040 VDU 23,224,0,0,0,0,0,0,0,15
3050 VDU 23,225,0,0,0,0,0,0,15,255
3060 VDU 23,226,0,0,0,0,0,15,255
     ,255
3070 VDU 23,227,0,0,0,0,15,255,255
     ,255
3080 VDU 23,228,0,0,0,0,0,128,128
     ,192
3090 REM ends of middle row
3100 VDU 23,229,255,127,127,63,63
     ,31,31,15
3110 VDU 23,230,192,224,224,240,240
     ,248,248,252
3120 REM 5 characters for bottom
      row
3130 VDU 23,231,15,7,7,3,3,1,1,0
3140 VDU 23,232,255,255,255,255,255
     ,255,255,240
3150 VDU 23,233,255,255,255,255,255
```

Turn to Page 110

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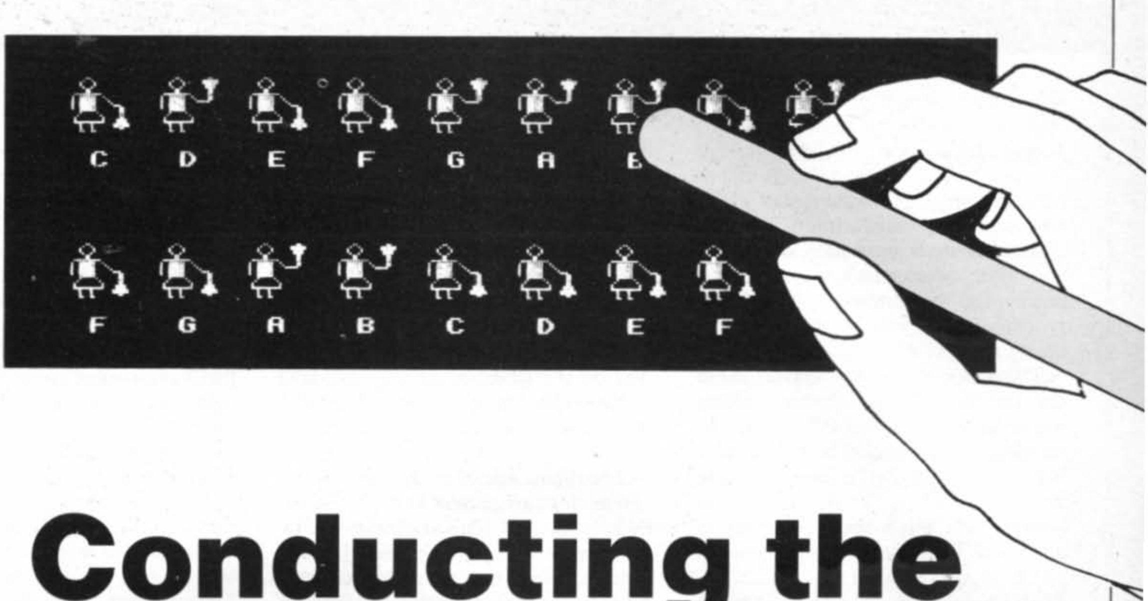

Conducting the light fantastic

By MIKE COOK

THE BEEB BODY BUILDING COURSE

PART 8

THE Editor wandered over to my work bench and picked up this month's project. "Is this it, Mike?" he enquired. "It's not very heavy". "No", I replied, "it's a light pen". After extracting it from my throat I was surprised to find it still worked.

A light pen allows you to interact with the computer without recourse to the keyboard. This is particularly useful if people who are not used to computers are going to use a program.

It avoids them being faced by the daunting sight of a large keyboard with lots of strange symbols. Also, for tasks requiring the indication of positions, a light pen offers a better alternative than entering co-ordinates from the keyboard.

The purpose of a light pen is to feed information from the display screen back to the computer, collecting light from the screen.

Most of the ones available for other computers are no more than light sensors, detecting whether they are pointing to a lit or unlit portion of the screen.

The BBC Micro, however, has built into it a 6845 CRT controller (Cathode Ray Tube – that's posh for TV screen). One of the features of this particular controller is that it allows a light pen to register the exact position it is pointing to on the screen.

Let's first look at how the computer – or any other picture source – generates a display on a screen.

As you will no doubt be aware, a TV picture is composed of a number of lines. So, for example, we speak of a 625 line TV standard, meaning the display is composed of 625 lines.

The lines are not displayed simultaneously but in sequence. As they are displayed very rapidly persistence of vision results in us perceiving a continuous display. Even so, the TV set is not capable of producing a line as such, but only a single spot.

Again, the illusion of a line is given by moving the spot very rapidly. The path of the spot is a zigzag, moving from the top to the bottom of the screen (see Figure I), covering the screen in a raster pattern.

It does this 50 times a second and still manages not to get dizzy. If, in addition to moving the spot, we control its brightness, we can display any pattern of light and shade on the TV display.

When the computer generates a display with a raster scan it must turn the spot on and off at exactly the right time to generate characters and graphics. To do this it must be aware of where the spot is at any time.

This is achieved by sending synchronising pulses to the TV telling it to move the spot to the left hand side (in the case of a line sync pulse) or the top of the display (in the case of a frame sync pulse).

So by using these pulses the computer synchronises the raster on the screen. The computer can determine the X co-ordinate of the spot by the time elapsed since the last line sync pulse.

And by counting the number of line sync pulses given since the last frame sync pulse it knows the Y co-ordinate.

This keeping track of the spot is done by the CRT controller in the BBC Micro. It is a hardware device consisting of a number of counters to deter-

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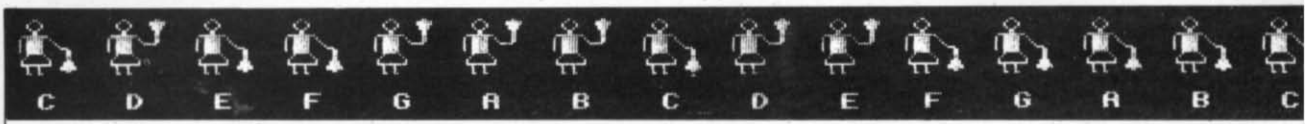


From Page 65

mine the length of all the pulses which need to be generated.

In addition, it must address the portion of the computer's memory containing the brightness of the spot in synchronisation with the movement of the spot.

The CRT controller has an input that stores a copy of this address whenever it receives a falling edge (a transition from a logic 1 to a logic 0). It is this input that can be used by a light pen.

If we hold a light sensitive device on the raster it indicates light only when the spot is directly underneath it. So as the spot speeds past it, a pulse is generated.

SOME early models of the BBC Micro have a small hole in the case for the analogue input port.

This can result in the screws holding the cover on the 15-way D-type plug preventing the plug from being pushed fully home. It can be remedied in two ways:

- **File a larger hole in the plastic case. This is quite easy if all the electronics are removed, as the plastic is quite soft.**
- **Attach the cover of the D-type plug with some adhesive that can be removed if necessary. Suitable adhesives include rubber based (Copydex) types and silicon rubber types such as those used to seal around baths.**

This pulse is fed into the CRT controller to freeze the address which is being generated at that instant (see Figure II).

The computer program then looks at that address and so works out exactly where the light sensitive device was on the screen.

In practice, things are not as simple as that (they seldom are!). For a start, the spot is moving very fast and the light sensitive device needs to be able to respond equally quickly.

Even when this is achieved, there will be delays between the generation of the spot and its display, so the address captured is displaced by a constant factor.

The brightness of the spot ensures that it causes a pulse as it passes on more than one line. Also, the address generated by the CRT controller is not immediately useful, as its interpretation depends upon the graphics mode being used.

Finally, there is no way of telling from the CRT controller when the captured address was last updated, so you only know the last place the device was on the screen.

Nevertheless, none of these problems, as we shall see, are insurmountable.

The light sensitive device I have chosen for this project is the SD4324-002 sweet spot photodector made by Honeywell. This has a built-in lens (known as a sweet spot due to its small spherical shape), amplifier and Schmitt trigger.

This last term might need a little explaining. The Schmitt trigger is an amplifier that produces a digital output (0 or 1) depending on whether the voltage on its input is above or below a threshold level. It is used to clean up the edges of slow or noisy signals.

Its main characteristic is that it exhibits hysteresis. In other words, the threshold level for a positive transition is different from that for a negative transition.

This prevents a slow, noisy edge from producing oscillation around the threshold point (see Figure III).

In our light pen the inclusion of this circuit ensures there is never an intermediate output level produced by just missing the spot.

As all these functions are crowded into one device, the circuit of the light pen is very much simplified. Indeed, you could construct a light pen using just this and a wire and plug for the analogue input port.

However, as mentioned earlier, this would be unable to detect when the screen was being pointed at. To do this we need to add a little more circuitry. The full circuit of the light pen is shown in Figure IV.

The sweet spot device generates pulses when the raster spot flies past it. These pulses are fed into the CRT controller via pin 9 of the analogue input port connector. The same pulses are also used to charge a capacitor.

The diode is included to ensure that the only discharge path for the capacitor is the resistor R3. The voltage on the capacitor is fed into the A/D converter on channel one.

If the light pen is not pointing at the screen only a very small voltage is present. Also, if the light pen is pointing at a bright light or out of the window, a large voltage is present.

Only when the pen is pointing at a display do the pulses produce a mid-range value. I find that the instruction:

ADVAL(1) DIV 64

produces a value around 300 when the light pen is pointing at the screen. (See the May issue of *Micro User* for the reason why it is advisable always to use DIV 64 with an ADVAL instruction).

The sweet spot device can be fitted in the barrel of an old pen, although you might have to snip off the tag to get it to fit. I find that old felt tip pens used for overhead projector transparencies are ideal.

A small hole should be drilled in the end to allow the wire to come out. I used sub-miniature twin-cored screened cable.

The other components can be mounted on the back of the 15 way D-type plug as the plastic shroud gives enough room. This calls for a little care

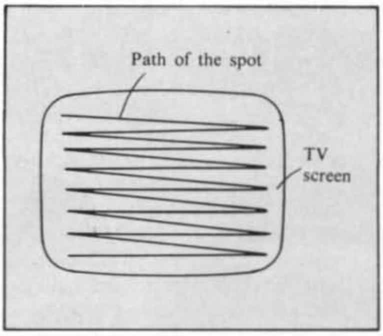


Figure I: The zizag path of the spot tracing a raster

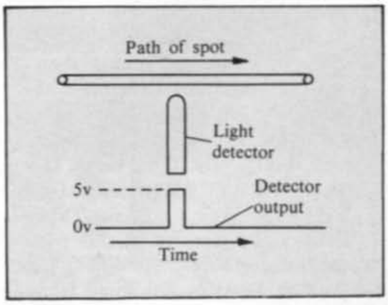
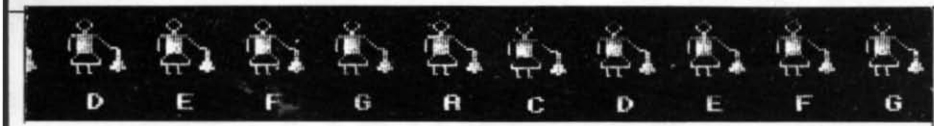


Figure II: The pulse produced by the light detector as the spot passes it



THE BEEB BODY BUILDING COURSE

in construction, keeping all the component leads as short as possible.

Figure V shows the way the components are arranged. Make sure the capacitor and diode are the right way round or it will not work, although no damage will result if they are wrong. Sorry, no showers of sparks and loud explosions this time.

Having built the pen we need to test it. The program in Listing 1 will do that. Plug in the light pen and run the program.

You will first be asked for the mode you want to use and then you will see a series of characters appear followed by three numbers,.

The first two numbers are the address which was being generated by the CRT controller when the spot passed under the light pen, and the third is the ADVAL value indicating whether the light pen is pointing at the screen.

As you point the light pen at the screen you will see all three numbers change as well as the cursor appearing to the right of where you are pointing. If nothing happens, then try increasing the brightness on your display.

If a plastic visor is fitted in front of the screen this may have to be removed so that the pen can be brought into closer contact with the screen.

If you still have no luck, check your construction thoroughly. The position of the cursor is displaced from the light pen because this is where the CRT controller thinks the pen is, owing to delays in the display circuit.

I have found that some TV sets produce a slightly darker display at the edges and so you might have to increase the brightness to compensate.

By pointing to the first character on the screen you can find the offset value that we will use later on. This will be different in some modes and could be different on other TV displays.

The CRT controller consists of 18 registers, but only occupies two places in the computer's memory.

To do this trick it uses one memory location (&FE00) to decide which register shall appear at the other memory location (&FE01).

This is like reading a book through a piece of cardboard with a slot cut in it – you can read the whole book but only one line at a time.

So, before we can access a register in the 6845 CRT controller, we have to store its address in the address register. The registers we are interested in are the light pen position registers 16 and 17. These contain the address being generated by the CRT controller when the light pen produces a falling edge.

Note that registers 0 to 13 are Write Only registers and so cannot be examined. Registers 14 and 15 are the only read/write registers in the controller and determine the position of the flashing cursor.

What the test program does is to copy the contents of the light pen registers into these registers to display a cursor.

Note, however, that the computer does not think the cursor is in this position, and so this method cannot be used to set it.

It is a convenient way to test the light pen and let you observe the raw data being produced.

If you look closely you will see that in some modes the cursor is not directly under a character but in some in-between position. This is because in some modes there is more than single character resolution.

Occasionally the light pen will register a false position in the test program. This can be caused by the pen registers being changed while they are being read.

To cure this we must make the reading of the registers very quickly (that is, use machine code) and make sure they are read when the spot is not under the pen as then they are changing.

To do this we can use the *FX 19 instruction, but this is only available on operating system 1.0 onwards.

Another cause of false readings is the fact that the light pen input is not synchronised with the CRT controller clock.

This is an omission of the circuitry in

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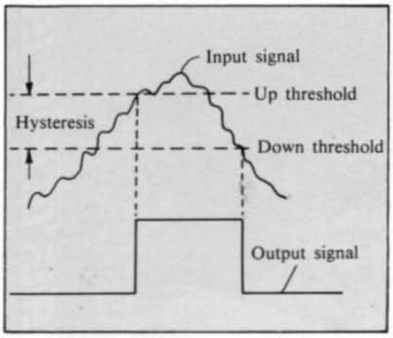

Figure IIIa: The input and output signals through a Schmitt trigger

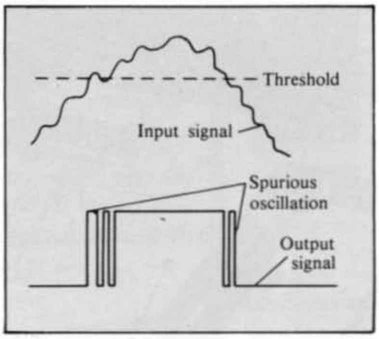

Figure IIIb: The false edges that can occur without hysteresis

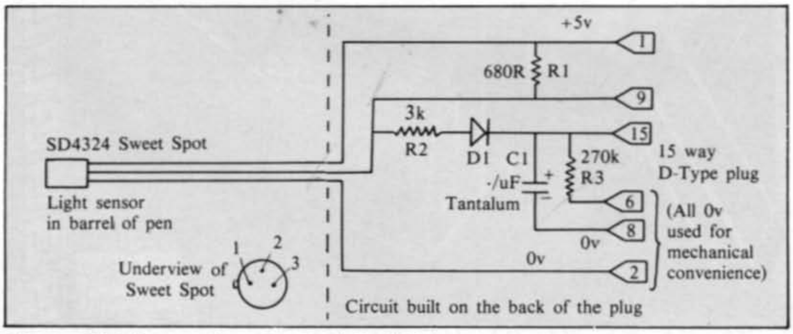

Figure IV: The complete circuit of the light pen

SNOWBALL
IX

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- Which Micro & Software Review, August

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- Popular Computing Weekly, 12 May & 23 June

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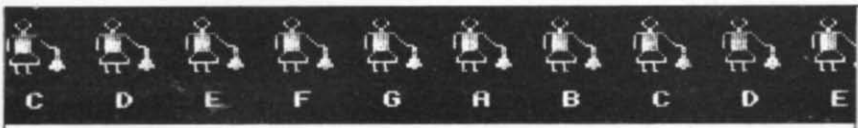

THE BEEB BODY BUILDING COURSE

From Page 67

the BBC Micro and, short of delving about inside the computer, there is nothing that can be done. However, in practice this is hardly ever noticeable.

If you want to know more about the CRT controller "CRT Controller Handbook" by Gerry Kane provides details of the 6845 along with some others.

The book only describes the controller and not the way it is used in the BBC Micro, but its opening chapter on principles of operation is quite good. Apart from the first chapter, however, I would not recommend it for beginners.

To make the light pen really useful we need some software to return the pen's position in co-ordinates which Basic can understand.

Body Build Pack No 6 consists of: SD4324-002 sweet spot light detector; C1 0.1 uF Tantalum capacitor; R1 680R; R2 3k; R3 270k; D1 Any small-signal diode like 1N4148; 15-Way D-Type plug cover; 2 ft Twin core screened cable.

A fully assembled light pen is also available as a special offer to readers of _The Micro User_.

● You can order these, as well as previous Body Build Packs, by using the order form on Page 73.

I felt it would be most useful if the position of the light pen were returned in the same format required by the TAB function.

However, such a program on its own would be boring in the extreme, so I have built around it a demonstration of the sort of application in which a light pen can be used.

The program, shown in Listing 2, allows you to be in charge of 20 young and obedient campanologists – the BBC All Stars. Just point your baton (or light pen) and bells will be rung for as long as you command.

Three procedures can be culled from this program and used in your own applications. The first of these is PROC_LINT, which initialises the variables needed to convert the CRT controller value into a TAB position.

It also compiles the machine code that accesses the registers in the CRT controller. This machine code puts the values into the X and A registers so that a USER instruction will return them combined into one number.

The procedure needs to be called only once at the beginning of the program. If it is called more than once you will get an error as it tries to redimension an array.

Of the other two procedures, PROC_LPOINT waits until the pen is pointing at the screen and then calls PROC_LPOS which returns the position of the pen in the two variables PYPOS and PXPOS.

These positions are calculated from the value in the light pen register of the CRT controller (variable PVAL) and the constants determined by the mode.

Note that they will only return the correct value if no scrolling has taken place. This is because scrolling affects the base address (or first address) of the CRT controller.

The constant TLAG is the time lag or offset value which might have to be adjusted by one or two for any particular TV display.

The remaining constants are LPR, which denotes how many controller counts constitute one row of characters, and LPC, which denotes how many controller counts there are for each displayed character.

In this set of procedures the display mode is given by the global variable M% and must be changed whenever the mode is changed.

Observe that all the procedures start with the underscore character which is to be found on the £ key.

If you are typing in the program using Mode 7 this may be confused with the minus sign. If it is, you will get an error message when the program is run.

The rest of the program is fairly straightforward. A string of user-definable characters is set up for the graphics and this is compiled into a string for rapid display.

There is a separate string for the figure of the bellringer and each of the two positions of the bells in order to speed up the graphics.

The program ensures that a bell is only rung when the light pen is pointing at one of the two rows.

For the musical among you, the scale is in the key of C, but could be changed by altering lines 430 and 450, although I have not tried this.

As with most Body Building exercises, the program presented here is only a beginning to explore the hardware.

Using the light pen and these procedures you can write all sorts of programs – multiple choice quizzes, entering moves for board type games and all sorts of games that would not otherwise be possible.

I only wish I had time to write a light pen trombone program.

Just remember, the light pen collects light from the screen, so make your target characters as light as possible. This means using characters like hash or @ – or better still, a solid block.

As somebody once said, "The uses of a light pen are limited only by your own imagination".

NEXT MONTH: If you feel it is too early to start thinking about Christmas then Exercise No. 9 might change your mind.

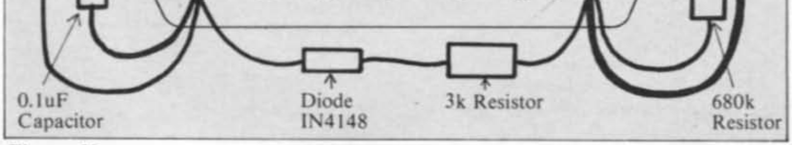

Figure V

Listing: Page 70
Order form: Page 73

Beeb Body Building Course listing

From Page 69

```
 10 MODE 7
 20 PRINT "BEEB BODY BUILDING COURSE"
 30 PRINT "OCTOBER 1983"
 40 PRINT "LIGHT PEN TEST FOR SCREEN
    BRIGHTNESS"
 50 PRINT "THE CURSOR WILL MOVE TO
    THE RIGHT OF PEN"
 60 INPUT "WHAT MODE DO YOU WANT
    TO TEST ",M
 70 MODE M
 80 FOR A=1 TO 630
 90 PRINT "*";
100 NEXT
110 A=ADVAL (1) DIV 64
120 ?&FE00=16
    :MSB=?&FE01
130 ?&FE00=17
    :LSB=?&FE01
140 PRINT TAB(0,15);MSB;" ";LSB;
    " ";A;"    "
150 VDU 23,0,14,MSB,0,0,0,0,0,0
160 VDU 23,0,15,LSB,0.0,0,0,0,0
170 FOR A=1 TO 10
180 *FX19
190 NEXT
200 GOTO 110
```

```
 10 REM BEEB BODY BUILDING COURSE
    OCTOBER 1983
 20 REM By Mike Cook
 30 M%=4
 40 PROC_LINT
 50 MODE M%
 60 ENVELOPE 1,4,0.0,0,0,0,0.127,-8.-
    9,-8,127,49
 70 PRINT SPC (10);"THE LIGHT FANTAST
    IC"
 80 PRINT
 90 PRINT SPC (15);"STARRING"
100 PRINT
110 PRINT "THE BBC LADIES CAMPANOLOGY
     ALL-STARS"
120 PRINT TAB(0,30),SPC (10);"Conduct
    ed by LIGHT-PEN"
130 PROC_GIRL
140 PROC_LPOINT
150 IF PYPOS=11 OR PYPOS=20
    THEN 160
    ELSE 140
160 RING=PXPOS DIV 4
170 IF PYPOS=11
    THEN P=1
    ELSE P=11
180 PRINT TAB(RING+4,PYPOS-1),BELL$(U
    PDOWN(RING+P-1))
190 UPDOWN(RING+P-1)=UPDOWN(RING+P-1)
    EOR 1
200 SOUND 1,1,NVAL(RING+P),1
210 *FX19
220 GOTO 140
230 DEF PROC_GIRL
240 DIM BELL$(1),UPDOWN(20),NVAL(20)
250 VDU 23,1,0;0;0;0;
260 VDU 23,244,1,2,4,4,2,1,1,31
270 VDU 23,245,128,64,32,32.64,128.12
    8,248
280 VDU 23,246,39,39,39.39,39,39.7,4
290 VDU 23,247,228,226,225,224,224,22
    4,224,16
300 VDU 23,248,8,16,16,31,4,4,4,6
310 VDU 23,249,8,4.4,252,64,64,64,96
320 VDU 23,250,24,126,126,60,60,24,24
    ,24
330 VDU 23,251,24,24,240,0,0,0,0,0
340 VDU 23,252,0,0,0,128,112,24,24,24
350 VDU 23,253,24,24.60,60,126.126,24
    ,0
360 GIRL$=""
370 BS$=CHR$ (10)+CHR$ (8)
380 FOR A=244 TO 249 STEP 2
390 GIRL$=GIRL$+CHR$ (A)+CHR$ (A+1)+B
    S$+CHR$ (8)
400 NEXT
410 BELL$(0)=CHR$ (9)+CHR$ (9)+
    CHR$ (250)+BS$+CHR$ (251)+BS$+
    CHR$ (32)
420 BELL$(1)=CHR$ (9)+CHR$ (9)+
    CHR$ (32)+BS$+CHR$ (252)+BS$+
    CHR$ (253)
430 VNOTE=67
440 INOTE=1
    :SNOTE=1
450 NVAL(0)=93
460 PROC_PGIRL(10)
470 PROC_PGIRL(19)
480 ENDPROC
490 DEF PROC_PGIRL(P)
500 PRINT TAB(0,P)
510 FOR A=0 TO 39 STEP 4
520 PRINT TAB(A,P),GIRL$
530 PRINT TAB(A,P),BELL$(0)
540 PRINT TAB(A+1,P+4),CHR$ (VNOTE)
550 UPDOWN(INOTE)=1
560 NVAL(INOTE)=NVAL(INOTE-1)+8
570 IF SNOTE=4 OR SNOTE=8
    THEN NVAL(INOTE)=NVAL(INOTE)-4
580 VNOTE=VNOTE+1
590 IF VNOTE>71
    THEN VNOTE=65
600 INOTE=INOTE+1
610 IF SNOTE=8
    THEN SNOTE=2
    ELSE SNOTE=SNOTE+1
620 NEXT
630 ENDPROC
640 DEF PROC_LINT
650 DIM TLAG(7),LPC(7),GRAB% 20
660 P%=GRAB%
670 [
680 LDX £16
690 LDA £17
700 STX &FE00
    :LDX &FE01
710 STA &FE00
    :LDA &FE01
720 RTS
730 ]
740 RESTORE 780
750 FOR A=0 TO 7
760 READ TLAG(A),LPC(A)
770 NEXT
780 DATA 1542,1,1542,2,1543,4,2053,1
790 DATA 2820,1,2820.2.3076,1,10248.1
800 ENDPROC
810 DEF PROC_LPOINT
820 REPEAT
830 A%=ADVAL (1) DIV 64
840 UNTIL A%>100 AND A%<1000
850 PROC_LPOS
860 ENDPROC
870 DEF PROC_LPOS
880 *FX19
890 PVAL=(USR (GRAB%) AND &FFFF)-TLAG
    (M%)
900 IF PVAL<0
    THEN PVAL=0
910 LPR=80
920 IF M%>3
    THEN LPR=40
930 PYPOS=PVAL DIV LPR
940 PXPOS=INT ((PVAL MOD LPR)/LPC(M%))
950 ENDPROC
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July issue of The Micro User.

This listing is included in this month's cassette tape offer. See order form on Page 93.

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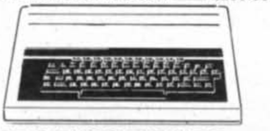

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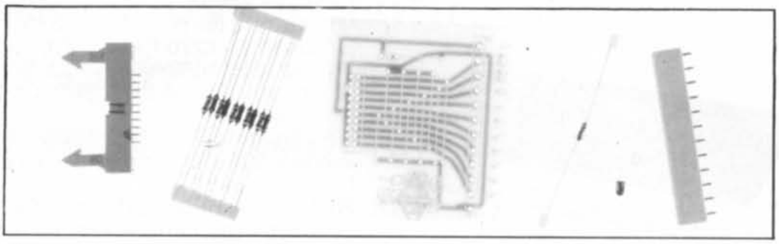
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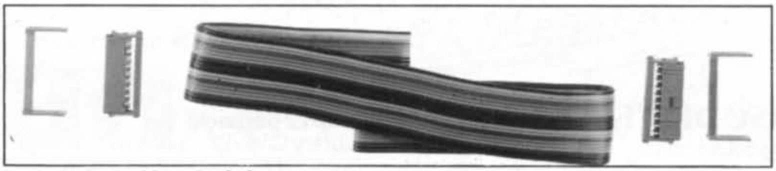
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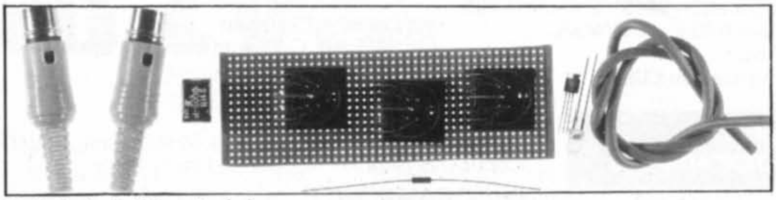
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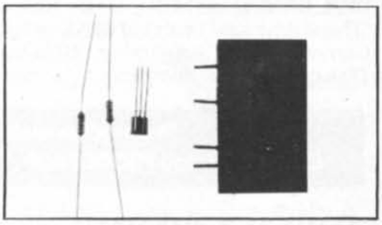
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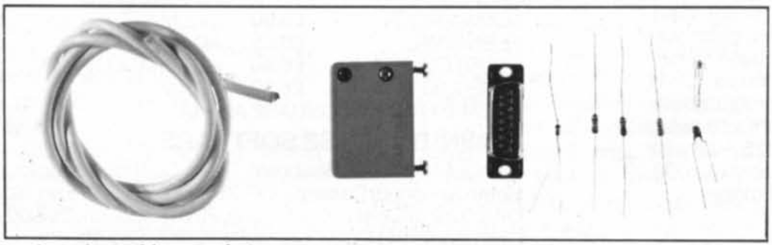
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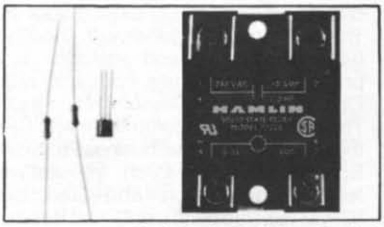

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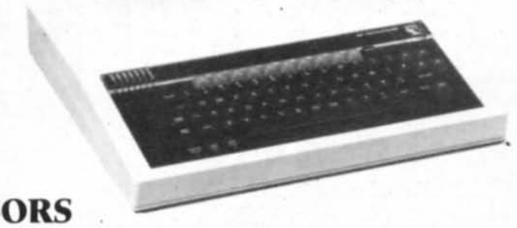

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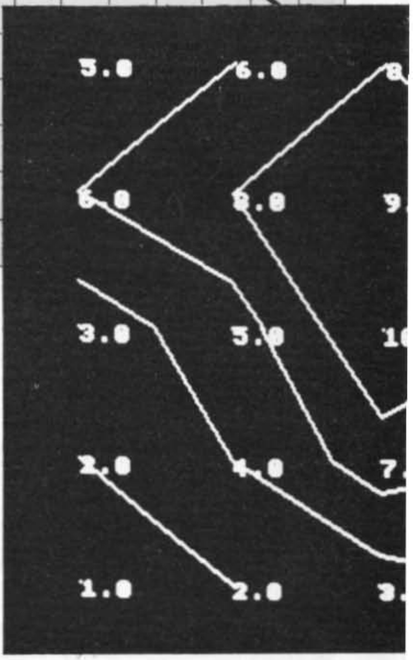
PLOTTING CONTOUR MAP



CONTOUR maps are plotted by many other people besides the Ordnance Survey. Architects and landscape gardeners use contour maps of the areas on which they are working and meteorologists use contours to plot air pressure and temperature, although they call them isobars and isotherms.

Engineers and scientists use contour maps to describe variations in measured results over two dimensional surfaces such as temperature on the surface of an aircraft wing or deviation from the correct shape in a telescope mirror.

There are two different methods of plotting a contour map. In the first each contour is plotted separately in its entirety. A starting point is found and it is traced round and plotted until it is complete.

In the second method the area to be covered is divided into cells, each of which is examined separately and plotted. For each contour, this method looks at each cell in turn and decides whether the contour passes through it. If it does, the portion of the contour within the cell is plotted, and the method then goes on to examine the next cell.

By JOHN THORPE

While the first method would probably be the one used by a human being plotting a contour by hand, there are difficulties in adapting it for a computer. One is that it is hard to find a starting point on a given contour.

Another is it is very easy to miss out parts of a contour, or even whole contours, if the one being followed passes outside the area being covered, or if there are two or more contours of the same height in different parts of the map.

The second method is therefore adapted in our program. This is illustrated in Box A.

The program assumes that measurements of the surface to be plotted have been made at all the corners of a rectangular gird. This assumption is exploited by making each of the rectangles defined by the grid into a separate cell for the purposes of plotting.

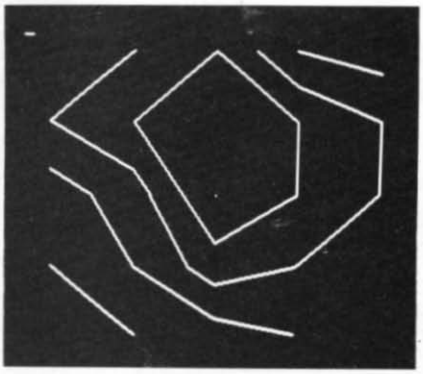
Landscape gardeners and engineers commonly measure the areas that they wish to plot on a rectangular grid, but this is not always the case for geographical maps or weather maps, where the triangulation points or weather stations tend to be much more randomly distributed.

The method described here can, however, be adapted to use cells which are irregular quadrilaterals or even triangles, which would allow even the most randomly distributed set of measurement points to be plotted.

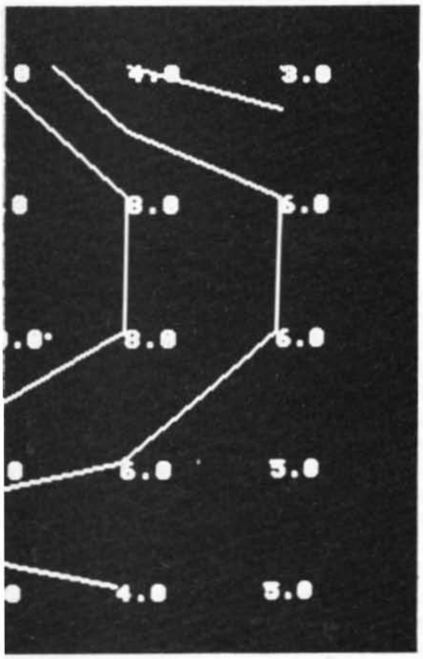
When the method comes to a cell, its first task is to decide whether the contour that it is considering passes through the cell and, if so, where. This is done by looking at each side of the cell in turn and deciding whether the contour crosses it.

The contour crosses the edge of a cell if, and only if, one of the ends of that edge is higher than the contour and the other is lower. If both ends of the edge are the same height as the contour, then the contour passes directly along that edge.

Once the method has decided that the contour passes through the side of a cell it calculates an estimation of the position where the crossing occurs. This is done for all the sides of the cell



Output can be just the contours, as above, or with measurements displayed (below).



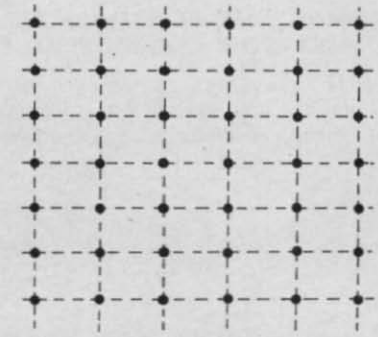
and all the crossing points are stored in an array. The way that each cell is examined is shown in Box B.

There are several possible methods of estimating the position at which a contour line passes through the side of a cell, each based on a different shape of surface passing through the points at which the height of the surface was measured.

The simplest approximates to the shape of the cross-section of the surface along the cell edge by using a straight line. This is called a linear interpolation scheme, and is illustrated in Box C.

Other more complicated schemes involve fitting quadratic or cubic curves

A: THE GENERAL ALGORITHM



The rectangular grid of measured points. Each blob represents a point where the height of the surface is measured. The dotted lines divide the surface into cells.

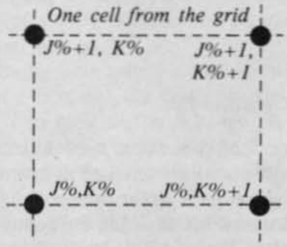
For each contour, the algorithm looks at each cell in turn, starting at the bottom left hand corner and working across the rows, one by one. Each cell is referred to by the values of J% and K% at the bottom left hand corner.

Each cell is examined by PROCSQ, which decides whether the contour passes through any part of the cell, and, if it does, plots that part of the contour. The algorithm then passes on to examine the next cell.

B: THE OPERATION OF PROCSQ

At each cell the algorithm searches round the edges of the cell in an anti-clockwise direction. This is achieved by storing the corners of the cell in three one dimensional arrays (two containing the coordinates and one the height).

The bottom left hand corner is stored twice, as first and fifth (last) elements of all the arrays, so that each edge is represented by two consecutive corners in the arrays. For each edge, the procedure first decides whether it is crossed by the contour.



If a crossing is made, the position of that crossing is estimated and the coordinates are stored in two further arrays.

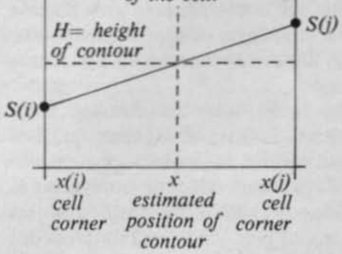
The last step of PROCSQ plots a set of straight lines joining all pairs of crossing points.

C: ESTIMATING A CROSSING POINT

The program uses a linear interpolation scheme to estimate where contours cross the edge of cells. This involves drawing a cross section of the edge of the cell, marking the heights of the measured points on it, and joining them together with a straight line.

The height of the contour is then marked on the diagram and the position where this intersects the line of the section is the estimated position of the contour.

Cross section along one edge of the cell.

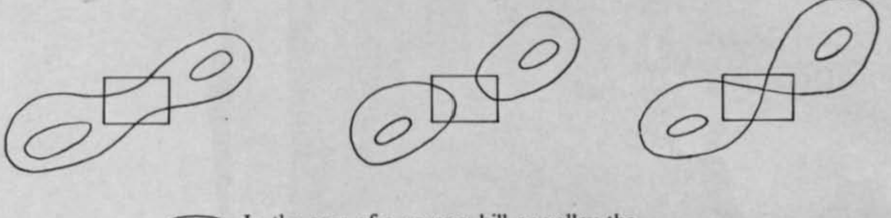


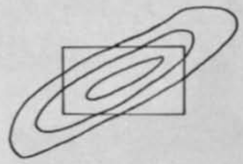
If this is done, the position of the crossing point of the contour is given by the equation:

$$x = (H-S(i))*(x(j)-x(i))/(S(j)-S(i)) + x(i)$$

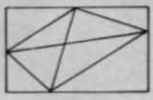
D: PROBLEMS AT SADDLE POINTS AND NARROW PEAKS OR VALLEYS

Problems can occur at either of the two cases of a saddle point or a narrow contour. The first problem is that the contour at a saddle point could be any one of the patterns shown below.





In the case of a narrow hill or valley the contours may follow the pattern shown left. In either case, the computer cannot distinguish which of the four patterns is intended and will plot a pattern like the one on the right.



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to the surface, but these need to consider more than just one cell at a time. The program uses linear interpolation.

Once the points at which the contour line crosses the edges of the cell have been estimated, all that remains to be done is to join them together with a suitable curve.

The program takes the simplest course (again) and uses a straight line, but it is possible to use curves which produce smoother contours with no sharp corners.

The only remaining problem is that of sorting out the connections when two different contours of the same height pass through a cell, or where the same contour passes through the cell twice.

This can occur either in very narrow ridges or valleys, or near saddle points, which are passes where a valley crosses a ridge.

The only way to resolve these problems is to use a finer grid of measurements to improve the resolution of the map, which is equivalent to reducing the size of the smallest object that it can plot. The program plots out all possible sets of contours if an ambiguity like this occurs.

Once the contour has been plotted in a single cell the method moves on and repeats the process in the next one. This process continues until all cells have been examined, which guarantees that all the contours of the height under consideration have been plotted.

The program then goes on to the next height and repeats the process until all the contours have been completely plotted.

Operating Instructions

THE program should operate adequately on both models of the BBC Micro. If you wish to save memory remove the spaces from in front of the Basic statements. Run the program in the usual way by typing RUN.

The first prompt asks for an entry of 0,1, or 2. If 2 is entered a single point will be plotted at every grid point on the map, accompanied by the height of that point. If a 1 is entered, the points are plotted without the heights, and if 0 is entered neither is plotted.

The program then asks for the number of rows (x values) and columns (y values) in the data, and the number of contours.

If the size of the problem entered at this stage is too large, a message will be printed and the program will ask for the number of x and y values again. Otherwise the program changes to MODE 4 and asks for values of the x co-ordinate followed by values of the y co-ordinate. A list giving all the values used (one per line) should be entered for each co-ordinate direction.

The program then prints out a set of pairs of co-ordinates, one for each measured point, going along each row in turn, and asks for the height at that point. The x-co-ordinate is given in the first column and the y-co-ordinate in the second column.When the entry of this is complete the program asks whether there are any errors. A single letter answer is sufficient for this entry, but a full word will also be accepted.

If there is an error, enter Y or Yes and the computer will ask which row and column the error is at. The program prints the co-ordinates corresponding to this point when the row and column numbers have been entered, and asks if they are correct.

If they are not correct the program returns to asking for row and column. If the co-ordinates are correct, the program asks for the height and then asks if there are any more errors.

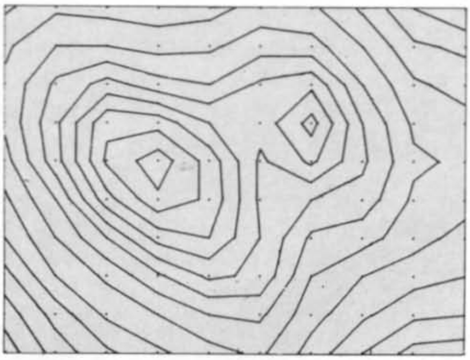
The program then asks for the height of each contour. These need not be sorted into order before they are entered.

The program finally plots the contour map.

NOTE that the program can be stopped at any time by pressing ESCAPE.

The program must be interrupted by pressing ESCAPE after the map has been plotted.

Co-ordinates must be entered in ascending order, but contours can be entered in any order.



These contours are plotted at steps of 50 ft, starting at 150 ft and increasing to 800 ft, for the following test data:

		x									
		0	100	200	300	400	500	600	700	800	900
	0	170	280	340	390	430	460	380	300	230	220
	100	220	320	410	450	500	510	420	360	310	300
	200	280	400	460	540	610	590	450	400	370	350
	300	350	450	550	670	700	600	490	470	420	380
	400	390	500	680	790	740	590	550	530	440	420
y	500	430	580	760	830	730	590	660	560	460	440
	600	460	590	740	730	650	620	720	550	440	420
	700	460	560	620	570	550	610	640	500	410	380
	800	440	500	500	480	490	530	520	450	360	340
	900	390	440	430	420	430	470	460	390	300	250

VARIABLES

Arrays

W(J%,K%) – Height of surface at measured point in row J%, column K%
X(K%) – X coordinate of column K%
Y(J%) – Y coordinate of row J%
HO(I%) – Height of contour I%
X1(J1%) – X coordinate of corner J1% of current cell
Y1(J1%) – Y coordinate of corner J1% of current cell
S(J1%) – Height of corner J1% of current cell
X2(J) – X coordinate of point where contour crosses cell wall J
Y2(J) – Y coordinate of point where contour crosses cell wall J.

Scalars

NX% – Number of columns
NY% – Number of rows
NC% – Number of contours
MX% – One less than NX% = (NX% – 1)
MY% – One less than NY% = (NY% – 1)
XA, XO – Constants needed to scale the display area x-axis
YA, YO – Constants needed to scale the display area y-axis
B% – Variable to control printing of measured points
I%, J%, K%, J1%, K1% – Loop control variables

Contour listing

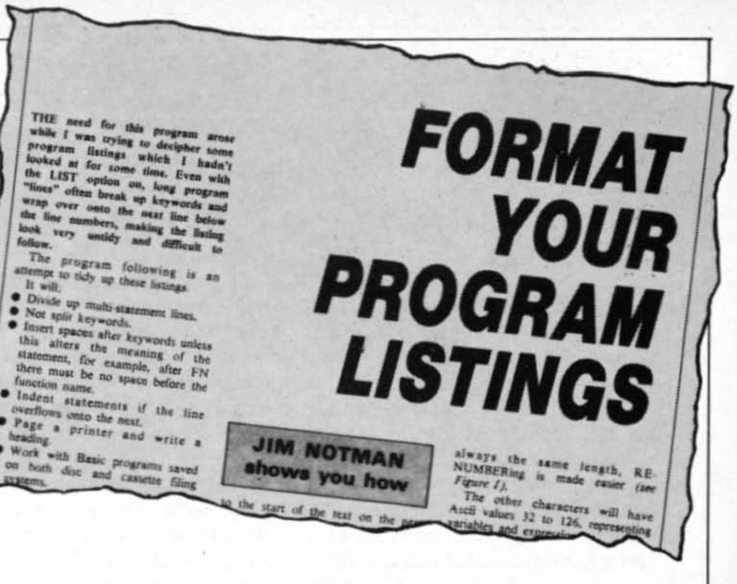
```
   10REM  **********************
   20REM  **   CONTOUR PLOTTER **
   30REM  **     J.C. THORPE   **
   35REM  **     (C) 25/9/83   **
   40REM  **********************
   50
   60REM             **          SET UP ARR
AYS         **
   70     MODE 7
   80     PRINT TAB(10,4)"CONTOUR PLOTTE
R"'
   85PRINT"ENTER:-"'
   90     PRINT "      2 TO PLOT HEIGHTS
 AT MEASURED                POINTS"'
  100     PRINT "      1 TO PLOT MEASURE
D POINTS"'
  110     INPUT "      0 TO PLOT NEITHER
       "'',B%
  120     PRINTTAB(0,17)"HOW MANY X VALU
ES ";
  130     INPUT NX%
  140     INPUT' "HOW MANY Y VALUES ",NY
%
  150     INPUT' "HOW MANY CONTOURS",NC%
  160     ON ERROR GOTO 900
  170     MODE 4
  180     PRINT:PRINT
  190     DIM W(NY%,NX%),X(NX%),Y(NY%),H
O(NC%),X1(5),Y1(5),S(5),X2(4),Y2(4)
  200
  210REM             **          ENTER DATA
           **
  220REM             *           COORDINATE
S          *
  230     PRINT "ENTER VALUES OF X COORD
INATE"
  240     FOR K%=1 TO NX%
  250        INPUT X(K%)
  260     NEXT K%
  270
  280     PRINT "ENTER VALUES OF Y COORD
INATE"
  290     FOR J%=1 TO NY%
  300        INPUT Y(J%)
  310     NEXT J%
  320
  330REM             *           HEIGHTS AT
 GRID POINTS   *
  340     PRINT "FOR EACH POINT ENTER HE
IGHT"
  350     PRINT "X","Y","HEIGHT"
  360     FOR J%=1 TO NY%
  370        FOR K%=1 TO NX%
  380           PRINT;X(K%),;Y(J%)," ";
  390           INPUT W(J%,K%)
  400        NEXT K%
  410     NEXT J%
  420
  430     INPUT "ANY ERRORS ",A$
  440     IF LEFT$(A$,1)="N" THEN 560
  450     IF LEFT$(A$,1)<>"Y" THEN 430
  460     INPUT "WHICH?  Enter row,colum
n",J%,K%
  470     PRINT "X = ";X(K%),"Y = ";Y(J%
)
  480     INPUT "OK ",A$
  490     IF LEFT$(A$,1)="N" THEN 460
  500     IF LEFT$(A$,1)<>"Y" THEN 480
  510     INPUT "ENTER HEIGHT ",W(J%,K%)
  520     INPUT "ANY MORE ERRORS",A$
```

→

Contour listing

From Page 79

```
 530     GOTO 440
 540
 550REM           *           HEIGHTS OF
 CONTOURS     *
 560     PRINT "ENTER HEIGHT OF EACH CO
NTOUR"
 570     PRINT "CONTOUR","HEIGHT"
 580     FOR I%=1 TO NC%
 590        PRINT I%,;
 600        INPUT H0(I%)
 610     NEXT I%
 620
 630REM           **          CONTOUR PL
OT          **
 640     PROCINIT(X(1),X(NX%),Y(1),Y(NY
%))
 650     CLS
 660     MX%=NX%-1
 670     MY%=NY%-1
 680     FOR I%=1 TO NC%
 690        FOR J%=1 TO MY%
 700           FOR K%=1 TO MX%
 710              PROCSQ(H0(I%),J%,K%)
 720           NEXT K%
 730        NEXT J%
 740     NEXT I%
 750
 760REM           **          PRINT POIN
TS/HEIGHTS    **
 770     IF B%=0 THEN 870
 780     @%=&00020101
 790     VDU 5
 800     FOR J%=1 TO NY%
 810        FOR K%=1 TO NX%
 820           PROCPOINT(X(K%),Y(J%))
 830           IF B%>1 THEN PRINT W(J%,
K%)
 840        NEXT K%
 850     NEXT J%
 860
 870     REPEAT UNTIL FALSE
 880
 890REM           **          ERROR HAND
LING          **
 900     IF ERR=11 THEN 940
 910     IF ERR=17 THEN 930
 920     PRINT "ERROR "ERR:REPORT:PRINT
" AT LINE "ERL
 930     VDU 4:@%=10:END
 940     MODE 7
 950     PRINT "SIZE OF PROBLEM TOO LAR
GE"
 960     PRINT "CONTINUE WITH SMALLER G
RID OR FEWER CONTOURS"
 970     GOTO 80
 980
 990REM           **          MOVE ON PLOT
TING PLANE    **
 1000    DEF PROCMOVE(X,Y)
 1010       X=X*XA+X0
 1020       Y=Y*YA+Y0
 1030       MOVE X,Y
 1040    ENDPROC
 1050
 1060REM          **          DRAW ON PLO
TTING PLANE  **
 1070    DEF PROCDRAW(X,Y)
 1080       X=X*XA+X0
 1090       Y=Y*YA+Y0
 1100       DRAW X,Y
 1110    ENDPROC
 1120
 1130REM          **          PLOT SINGLE
 SQUARE       **
 1140    DEF PROCSQ(H,J%,K%)
 1150
 1160REM          **          SET UP CELL
 CORNERS      **
 1170    X1(1)=X(K%)  :Y1(1)=Y(J%)  :S(
1)=W(J%,K%)
 1180    X1(2)=X(K%+1):Y1(2)=Y(J%)  :S(
2)=W(J%,K%+1)
 1190    X1(3)=X1(2)  :Y1(3)=Y(J%+1):S(
3)=W(J%+1,K%+1)
 1200    X1(4)=X(K%)  :Y1(4)=Y1(3)  :S(
4)=W(J%+1,K%)
 1210    X1(5)=X(K%)  :Y1(5)=Y(J%)  :S(
5)=W(J%,K%)
 1220
 1230REM          ** FIND ENDS OF CONT
OUR SEGMENTS **
 1240    FOR J1%=1 TO 4
 1250       X2(J1%)=-1
 1260       K1%=J1%+1
 1270       IF S(J1%)<=H AND S(K1%)>H T
HEN 1330
 1280       IF S(J1%)>=H AND S(K1%)<H T
HEN 1330
 1290       IF S(J1%)=H  AND S(K1%)=H T
HEN 1430
 1300       GOTO 1460
 1310
 1320REM          **          LINE FROM J
1 TO K1       **
 1330       IF X1(J1%)=X1(K1%) THEN 138
0
 1340          Y2(J1%)=Y1(J1%)
 1350          X2(J1%)=(H-S(J1%))*(X1(K1
%)-X1(J1%))/(S(K1%)-S(J1%)) + X1(J1%)
 1360       GOTO 1460
 1370
 1380          X2(J1%)=X1(J1%)
 1390          Y2(J1%)=(H-S(J1%))*(Y1(K1
%)-Y1(J1%))/(S(K1%)-S(J1%)) + Y1(J1%)
 1400       GOTO 1460
 1410
 1420REM          **          LINE ALONG
CELL EDGE     **
 1430       PROCMOVE(X1(J1%),Y1(J1%))
 1440       PROCDRAW(X1(K1%),Y1(K1%))
 1450
 1460    NEXT J1%
 1470
 1480REM          **          DRAW CONTOU
R LINES       **
 1490    FOR J1%=1 TO 3
 1500       IF X2(J1%)<0 THEN 1560
 1510       FOR K1%=J1% TO 4
 1520          IF X2(K1%)<0 THEN 1550
 1530          PROCMOVE(X2(J1%),Y2(J1%)
)
 1540          PROCDRAW(X2(K1%),Y2(K1%)
)
 1550       NEXT K1%
 1560    NEXT J1%
 1570
 1580    ENDPROC
 1590
 1600REM          **    INITIALISE PLOT
TING PLANE    **
 1610    DEF PROCINIT(X1,X2,Y1,Y2)
 1620       XA=1100/(X2-X1):X0=-X1*XA+9
0
 1630       YA= 900/(Y2-Y1):Y0=-Y1*YA+4
0
 1640    ENDPROC
 1650
 1660REM          **          PLOT ONE P
OINT          **
 1670    DEF PROCPOINT(X,Y)
 1680       X=X*XA+X0
 1690       Y=Y*YA+Y0
 1700       PLOT 69,X,Y
 1710    ENDPROC
```



THE need for this program arose while I was trying to decipher some program listings which I hadn't looked at for some time. Even with the LIST option on, long program "lines" often break up keywords and wrap over onto the next line below the line numbers, making the listing look very untidy and difficult to follow.

The program following is an attempt to tidy up these listings.

It will:

- Divide up multi-statement lines.
- Not split keywords.
- Insert spaces after keywords unless this alters the meaning of the statement, for example, after FN there must be no space before the function name.
- Indent statements if the line overflows onto the next.
- Page a printer and write a heading.
- Work with Basic programs saved on both disc and cassette filing systems.

FORMAT YOUR PROGRAM LISTINGS

JIM NOTMAN shows you how

to the start of the text on the

always the same length, RENUMBERing is made easier (see *Figure 1*).

The other characters will have Ascii values 32 to 126, representing variables and

FURTHER FORMATTING

JIM NOTMAN updates his formatter

JUDGING from my mail bag, the formatting program in the July 1983 *The Micro User* certainly created some interest. My thanks to all of you who wrote in, some with suggestions to make the program more useful.

At the moment the program will print a space after the RND keyword. To prevent this line 670 needs to be altered to:

```
670 FOR I%=0TO 127
    :IF NOT (I%=114OR I%=36OR I%=51
     OR RIGHT$(T$(I%),1)="(")
    THEN T$(I%)=T$(I%)+" "
```

If the escape key is pressed during printing the printer is still enabled. This line will also close all open files and handle any errors.

```
15 ON ERROR VDU 3,13
    :CLOSE #0
    :REPORT
    :PRINT '"On line ";ERL
    :END
```

An extra line (645) and alterations to lines 650 and 660 will allow the program to be used in both Basic1 and Basic 2 machines.

```
645 IF ?&8006=&60
    THEN A%=&8071
    :E%=&836B
    ELSE A%=&806D
    :E%=&8358
650 W$=STRING$(10," ")
    :REPEAT
    :W$=""
    :REPEAT
    :W$=W$+CHR$ (?A%)
    :A%=A%+1
    :UNTIL ?A%>&7F
660 T$(?A%-&80)=W$
    :A%=A%+2
    :UNTIL A%>E%
```

A number of readers wanted the program to be able to deal with control characters in a program line and with teletext characters.

In each case it will print the control character number enclosed by <brackets>.

A new procedure is defined:

```
1070 DEF PROCcontrol
1080 IF COUNT >MAX-4
     THEN PROCnextline
1090 IF COUNT <6
     THEN PRINT TAB(6);
1100 PRINT "<";C%;">";
1110 ENDPROC
```

If you have a printer which can underline characters this will make the control codes more noticeable. The next two lines work with the FX-80.

```
1095 VDU1,27,1,45,1,48
     :REM underline on
1105 VDU1,27,1,45,1,49
     :REM underline off
```

To install this new procedure the following lines are changed:

```
300 IF C%<32 OR C%=127
    THEN PROCcontrol
    :GOTO 340
910 IF COUNT >MAX-5 AND (C%=32
    OR C%>127)
    THEN PROCnextline
930 IF C%<32 OR C%>127
    THEN PROCcontrol
    ELSE PRINT CHR$ (C%):
```

'?Block' error was another problem some readers experienced when using

→

From Page 81

the formatter with the cassette filing system.

This is usually due to trying to read a file without motor control or if there is motor control the cassette unit is slow at stopping and starting.

When listening to a tape with a program or data on it, you will hear a series of buzzes (blocks of information) separated by tones (the interblock gap).

Information is loaded into the BBC a block at a time, the cassette relay being switched off at the end of each block.

The computer then deals with that information before switching the relay back on for the next block. On many Beebs you can hear this relay clicking.

Normally when loading or saving programs the time between switching off and on is very short.

However with data handling it will take longer to deal with each block.

If your tape unit has no motor control it will continue to wind on after the first block, so that when the Beeb is ready for more information the tape is already partly through the next block, hence the '?Block' error.

So if you have no motor control what can you do?

- If you can rig your cassette so you can hear it playing back while loading data and there is pause control on your unit, you could press the pause button for a few seconds during the tone (the interblock gap).

This is the simplest way, but very tedious in practice.

- Alter the interblock tone gap. According to the User Guide, page 398, the interblock gap can only be changed with data files, not with program files.

At startup the interblock gap is set for 2.5 seconds with data files. In some cases this is adequate, but when longer gaps are needed use *OPT3,x (where x is the gap in 10ths of a second).

Try *OPT3,60 here. It is easy to save the program in data file format using the following commands in one line.

```
X=OPENOUT ("PROGNAME"):
FOR I%=PAGE TO TOP
:BPUT#X,?I%:NEXT:CLOSE#X
```

When using this method make sure there is nothing to delay the program such as screen paging. Also if using a slow printer the interblock gap should be made longer.

- Have your cassette unit altered to incorporate remote motor control.
- Get a cassette unit which has motor control.
- Decide you've had enough of cassettes and get a disc drive – the ideal solution, if you can afford it.

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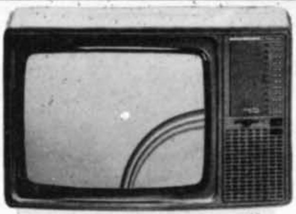

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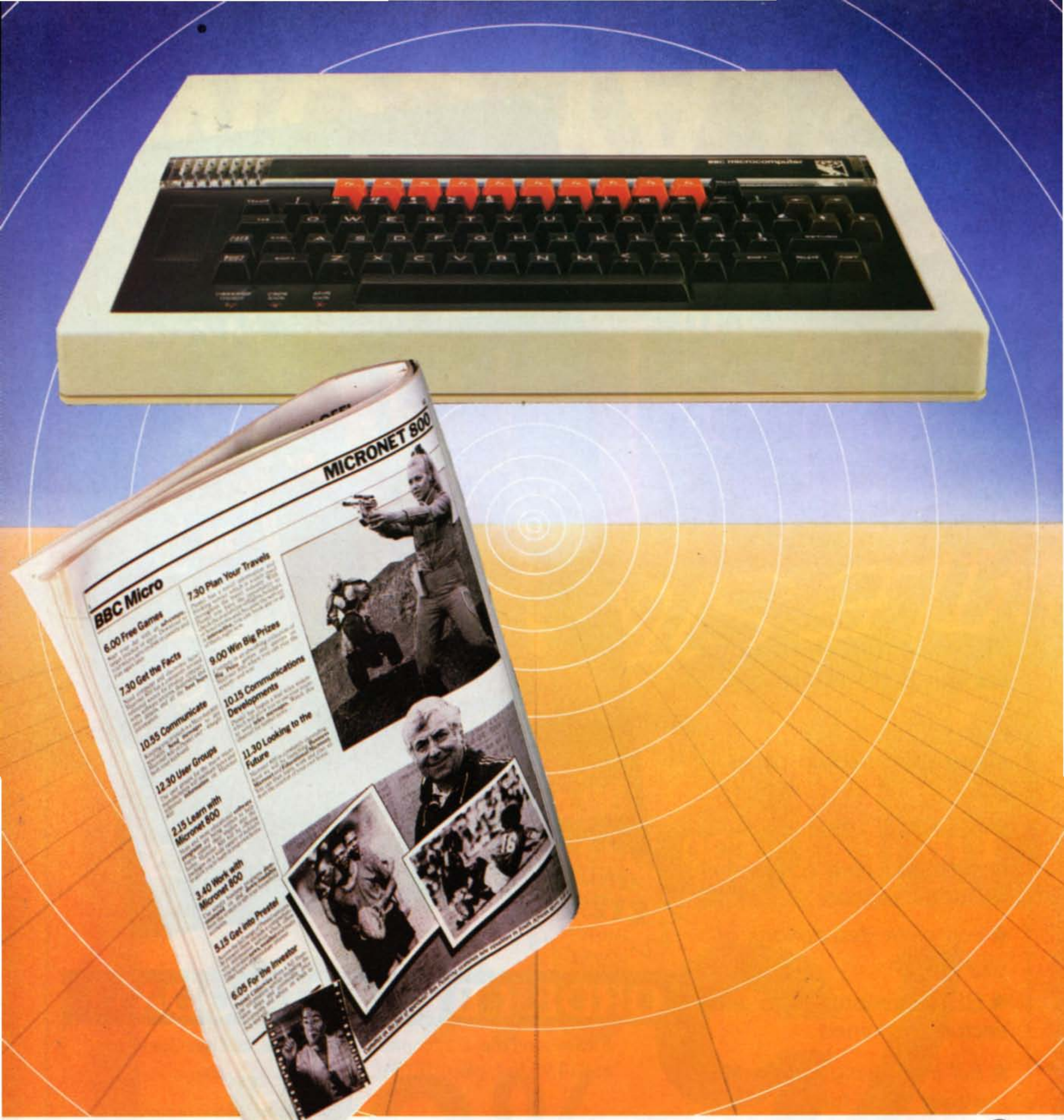

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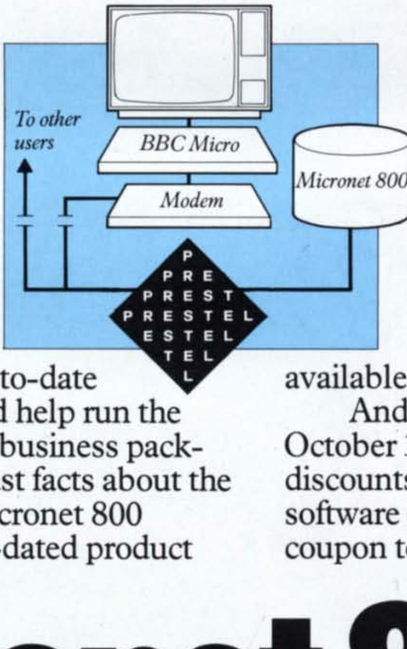

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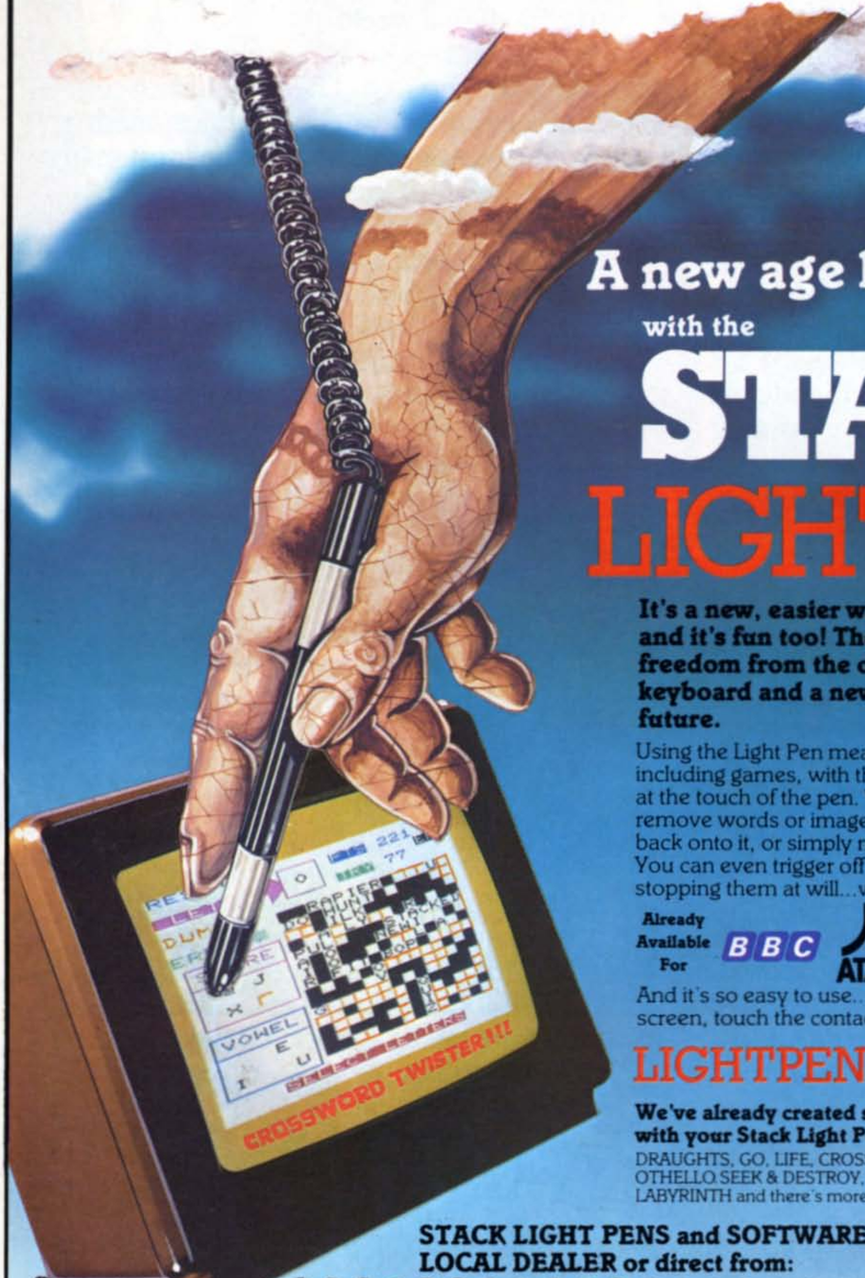
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Stir up the action with Joykeys

By MARK SMIDDY

JOYKEYS is a utility that will enable you to add joysticks to most programs that use single letter input from the keyboard. Which means almost all the games that have appeared in *The Micro User*.

Unfortunately, for technical reasons, it will not work with programs using negative INKEY to detect key closures.

When you run the program you will be asked to indicate which key is used to indicate up, down, fire and so on. Having done so the program assembles a machine code routine into &D00.

The joysticks will then function instead of the keys. (Disc users will have to relocate the routine.)

The program also allows you to save the assembled code.

In writing Joykeys I had to take several things into consideration, not least simplicity.

For reasons that will become clear, the program is for OS 1.2 on a model B. It has not been tested on OS 1.0 and will definitely not work on OS 0.1.

The ADC takes 20ms to complete conversion when using two channels, but will give intermediate values if sampled before conversion is complete.

Because of this, a regular interrupt, to sample every hundredth of a second or so, could not be used.

However when the ADC completes conversion the operating system can be made to generate an event which indirects through &220, &221 with the event code in the accumulator. This is enabled with *FX14,3.

By repositioning these vectors, machine code programs can intercept and act upon the events.

Choosing the type of keys to be simulated by the joysticks was not easy. After consideration I thought it best to use keys that could be inserted into the keyboard buffer using an OSBYTE call with A=128.

This means shift keys cannot be used, but this is no hardship since Joykeys is intended for use with Basic programs which are easy to modify.

This is how the program works:

Lines 10-240 print the instructions on the screen and input the Ascii values of the program's present control keys.

Lines 250-270 set up the parameters for the assembly.

Lines 280-460 successively enable the ADC event with *FX 14,3, select ADC channels 1 and 2 with *FX 16,2 and set the interrupt mask, since an event during the repositioning section would be disastrous. Finally they reposition the vectors, clear the interrupt flag and go back to Basic.

Lines 470-500 test for an ADC event, branching to the start if there is, otherwise branching back to the operating system via &D00.

Lines 510-610 save the registers on the stack, jump to the main routine, and retrieve the registers on return.

Lines 620-740 read ADC channel 0 and check to see if the fire button is pressed. If so it pokes the Ascii code for fire into the keyboard buffer and return to Basic. Otherwise it drops through to the next line.

Lines 750-830 read ADC channel 1 (by setting X to 1), then test the hi-byte to decide if the stick is pointing left or right.

Lines 840-930 similarly read channel 2, testing to decide if the joystick is moving up or down.

Lines 940-1040 load Y with the value corresponding to the joystick's position.

Lines 1040-1090 actually put the Ascii value into the keyboard and return to Basic.

A few extra points might be useful.

When testing the hi-byte of ADC channels 1 and 2 the values I have used (&E0 and &1F) can be trimmed to suit individual requirements. They could even be swopped round if the user prefers to hold his joystick another way.

The call to flush the keyboard buffer (*FX15,1 or *FX21,0) has been ommitted for two reasons. One is that a good games program would flush the buffer anyway.

The second reason is that leaving it in caused some rather strange effects, at worst slowing down the keyboard dramatically.

The fire button has been given high priority and, while activated, stops any further readings being taken.

If it is felt that this is a hindrance, remove the RTS instruction just before NOFIRE.

The machine code copies should be saved in a safe place in memory and called with a *RUN command – preferably before loading the Basic program that uses them.

→

From Page 87

```
   10 REM********JOYKEYS***********
   20 REM                         *
   30 REM   Copyright 1983 T.M.U. *
   40 REM                         *
   50 REM      By Mark Smiddy     *
   60 REM                         *
   70 REM*************************
   80 REM
   90 REM Six spaces between quotes
  100 *KEY0"      "
  110 REM Type line no, then KEY0
  120 REM
  130 MODE7
  140 REPEAT
  150 VDU12:PRINT'''"Input the movement keys now"'"N.B.:-CAPS LOCK, SHIFT LOCK, CTRL,"'"SHIFT, BREAK, AND ESCAPE are NOT valid"'"also DELETE, RETURN ,COPY, etc will"'"register but will not be diplayed"
  160 *FX4,1
  170 PRINT'"Key to move up    ";:up=GET:VDUup
  180 PRINT'"Key to move down  ";:down=GET:VDUdown
  190 PRINT'"Key to move left  ";:left=GET:VDUleft
  200 PRINT'"Key to move right ";:right=GET:VDUright
  210 PRINT'"Key to      fire  ";:fire=GET:VDUfire
  220 PRINT'"All ok?":REPEATG%=GET:UNTILG%=89 OR G%=78
  230 UNTILG%=89
  240 *FX4,0
  250 OSBYTE=&FFF4
  260 FORN=0TO2STEP2
  270 P%=&D02
  280 [      OPTN
  290 .SETVEC
  300         LDA #&00E
  310         LDX #&003
  320         JSR  OSBYTE \Enable ADC event
  330         LDA #&010
  340         LDX #&002
  350         JSR  OSBYTE \ Turn off ADC channels 3 and 4
  360         SEI \ Don't interupt just yet
  370         LDA  &221 \Save event vector
  380         STA  &D01
  390         LDA  &220
  400         STA  &D00
  410         LDA #MYVEC DIV 256 \HI byte of my routine
  420         STA  &221
  430         LDA #MYVEC MOD 256 \LO byte of my routine
  440         STA  &220
  450         CLI \ Clear to carry on
  460         RTS \ Back to BASIC
  470 .MYVEC
  480         CMP #&003 \Is it an ADC event?
  490         BEQ  START \ YES!
  500         JMP (&D00) \ Back to the OS
  510 .START
  520         PHP
  530         PHA
  540         TYA:PHA
  550         TXA:PHA \Save status etc for later
  560         JSR  BEGIN
  570         PLA:TAX
  580         PLA:TAY
  590         PLA
  600         PLP \ Get them all back
  610         RTS
  620 .BEGIN
  630         LDA #&080
  640         LDX #&000
  650         JSR  OSBYTE \ Read ADC for fire condition
  660         TXA
  670         AND #&003 \ Mask off HI bits
  680         CMP #&001 \ Test bit 1
  690         BNE  NOFIRE
  700         LDA #&08A
  710         LDY #fire
  720         LDX #&000
  730         JSR  OSBYTE \ Insert a FIRE condition
  740         RTS
  750 .NOFIRE
  760         LDA #&080
  770         LDX #&001
  780         JSR  OSBYTE \ Read ADC channel 1
  790         TYA \ Put the HI byte in A
  800         CMP #&01F \ Is the HI byte less than &1F
  810         BCC  RIGHT \ If it is the stick is pointing right
  820         CMP #&0E0 \ Is the HI byte more than &E0
  830         BCS  LEFT \ If it is the stick is pointing left
  840 .MIDDX
  850         LDA #&080
  860         LDX #&002
  870         JSR  OSBYTE \ Read ADC channel 2
  880         TYA \ Put the HI byte in A
  890         CMP #&01F \ Is the HI byte less than &1F
  900         BCC  DOWN \ If it is the stick is pointing down
  910         CMP #&0E0 \ Is the HI byte more then &E0
  920         BCS  UP \ If it is the stick is pointing up
  930         RTS
  940 .LEFT
  950         LDY #left
  960         JMP  KEYS
  970 .UP
  980         LDY #up
  990         JMP  KEYS
 1000 .RIGHT
 1010         LDY #right
 1020         JMP  KEYS
 1030 .DOWN
 1040         LDY #down
 1050 .KEYS
 1060         LDA #&08A
 1070         LDX #&000
 1080         JSR  OSBYTE \Put the ASCII code into the keyboard
 1090         RTS
 1100 ]:NEXT N
 1110 PRINT'"Save a machine code copy (Y/N)?"
 1120 REPEAT:G%=GET:UNTILG%=89 OR G%=78

 1130 IFG%=89 THEN PRINT'"FIND A SUITABLE AREA ON TAPE"':*SAVE"JOYKEY_OBJ"0D02 0D99 0D02

 1140 PRINT'"To put JOYKEYS on line type CALL SETVEC"'"To disconnect it type *FX13,3 or BREAK"'"On 'BREAK' CALL &D02 to restart"'"On *FX13,3 type *FX14,3 DO NOT CALL"'"SETVEC to reconnect"
>
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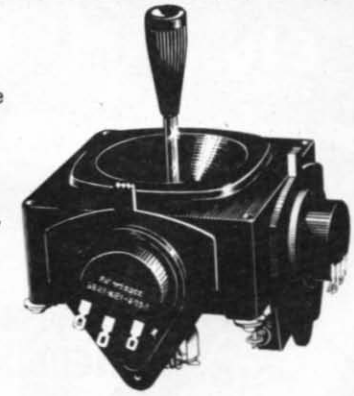

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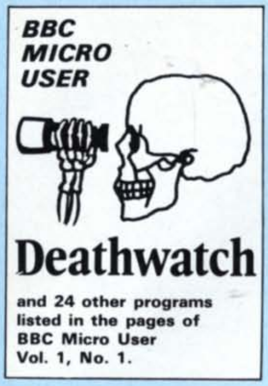
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and 24 other programs listed in the pages of BBC Micro User Vol. 1, No. 1.

March Issue

DEATHWATCH, a superb arcade game that challenges you to use your skill to fight off enemy battleships, tanks and helicopters; **BINGO**, illustrating clever uses of the randomise function; **BUBBLESORT** routines; **TESTS** for function keys in machine code routines; a useful **CASSETTE BUGS FIX** for users with OS 0.1 . . . and many **COLOUR** and **GRAPHICS ROUTINES** to help you create a kaleidoscope of screen designs which you can incorporate into your own programs.

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KING KONG
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April Issue

KING KONG, a fast moving game in which you pilot a helicopter to rescue girls perched on the Empire State Building before killing Kong; **GRAPHICS**, a suite of colourful demonstration programs; **NIM**, a structural game of strategy; **TOKENS**, first steps in unravelling the Basic ROM; **HOROSCOPES**, a fun program with useful error-trapping routines; **FORMATTER**, an essential disc utility; **DISASSEM**, a full machine code disassembler; **HEAT & LIGHT**, two measuring and plotting programs.

BBC
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May Issue

AIR STRIKE, a fast and furious arcade game that invites you to put your wits against maurading warplanes; Test your mental powers with **PELMANISM**; **25 ANAGRAMS** for you to solve; **CHARACTER**, to generate vertical and inverted text; **TELETEXT**, animation in Mode 7, really brings the screen to life; **LAB**, a trio of programs to interface laboratory equipment; 10 programs to investigate the **OSBYTE** routine; **BEEB**, two joystick exercises; plus more **COLOUR** and **GRAPHICS** routines.

THE
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June Issue

SPACE PILOT, lost in space with dwindling fuel supplies, you must fight off repeated attacks from alien life forms. To replenish fuel, you have to perform a tricky docking manoeuvre, while to repair the inevitable damage you must land on a mountainous planet. **NOMISM**, you are a nomadic herdsman desperately trying to eke out a living on the plains of Africa. Can you survive drought, tsetse fly and other hazards? A game that also helps to teach geography. **PLUS** other listings from the June issue.

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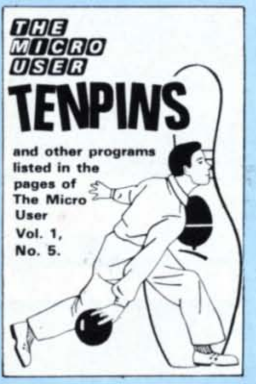
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July Issue

TENPIN, a highly entertaining simulation of Tenpin Bowling; **SPACEPODS**, Try to beat alien hordes; **CUP**, Exciting techniques to bring 3D graphics to the BBC Micro; **SCRSAVE** and **CSRLOAD**, Two programs to allow you to save and load screens to tape or disc; **TEST** and **STEADY**, A pair of programs to accompany the Beeb Body Building Course; **BREAKFIX**, Don't let the Break key destroy all your precious variables! **FORMAT**, Creates neater listings which are much easier to read.

THE
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FRUITIES
and other programs listed in the pages of The Micro User Vol. 1, No. 6

August Issue

FRUITIES, driven by strange urges you climb the ladders of adventure to risk all in the gardens of unearthly frights. Can you survive all the terrors that await you, or will you, too, fall victim to the evil Fruities? A really superb game. **ANIMATION**, a suite of programs that show you how to really bring your screen alive — an essential part of our course on animation on the BBC Micro. **CASDISC**, The essential machine code downloader for your disc system; **PLUS** other listings from the August issue.

THE
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USER
Robin and Marian
and other programs listed in the pages of The Micro User Vol. 1, No. 7

September Issue

ROBIN & MARIAN, a highly-challenging game in which you play the part of Robin Hood rescuing Maid Marian from the clutches of the Sheriff of Nottingham. **GALACTIC INVADERS**, an extremely well-written cross between two well-known arcade games. **DFS BENCHMARKS**, 14 programs to test out disc filing systems. **ANIMATION**, four programs to teach new techniques. **TERMINAL**, three programs to connect a BBC Micro to a mainframe. **PLUS** other listings from the September issue.

THE
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GONE FISHIN'
and other programs listed in the pages of The Micro User Vol. 1, No. 8

October Issue

FISHING, a compulsive simulation of a day's angling. **JOYKEY**, to convert your programs to joystick control. **PENTEST**, tests the Micro User light pen, and **BELLRINGER**, an amusing and musical way to use it. **CONTOURS**, an educational program with many uses. **LINKs**, two superb pieces of software to let BBC Micros talk to each other. **CHESS**, the winning entry in our June contest. **PLUS** six other programs from the pages of The Micro User, and all the listings from the first issue of Electron User.

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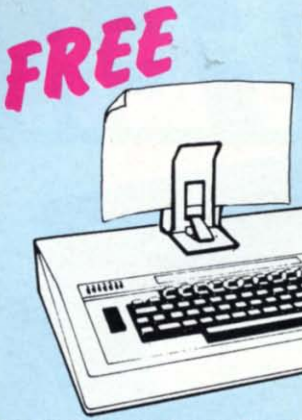

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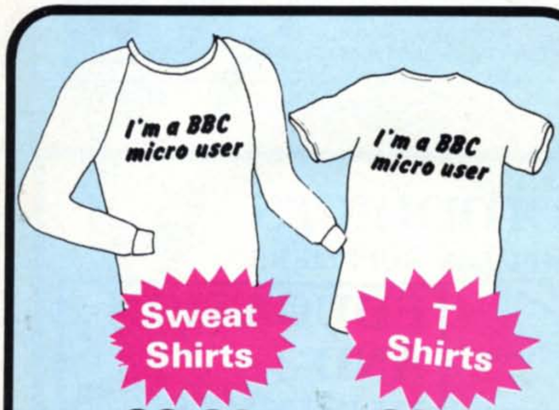
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BASICODE

It's a sort of all things to all machines type of language

By MAX PARROTT

HOW many times have you watched your friend's computer do something, thought to yourself, "I'd like to do that on mine", and then realised that it would take a long time because of the sheer volume of retyping involved?

Some people have attempted to remedy this predicament.

The first approach I came across was a Canadian program which allowed an Apple II to read a Pet's tape (Basic only) enabling the Pet program to be put into the Apple with as much translation as possible.

It was a brave attempt and worked very well – except, of course Pet graphics don't match those of the Apple, the Pet has a timer whereas the Apple hasn't, and so on.

In other words, any decent program on the Pet will just not work on the Apple without considerable time and effort being spent on it.

A Dutch radio programme, Hobbyscoop, which looks at electronic developments, hi-fi, space research, communications and computers, decided in 1978 to try transmitting computer programs over the air.

This was a natural progression from their earlier experiments in slow-scan television and viewdata pictures over the radio.

In 1979 regular transmissions of computer programs for the Apple, Pet, Tandy and Exidy Sorcerer began to take place, but the low Baud rates (300 for some of the machines) and consequent long transmission times for these began to pall. And, of course, only one brand of machine at a time could be serviced.

A group of enthusiasts found an answer when they produced a standard Basic which could be read and written by various home computers.

This has now been rewritten to form a new and relatively powerful language known formally as NOS-Basicode-2 which can be used by more than 17 different machines. The language has been used regularly on the air since last January.

Hobbyscoop is transmitted on Hilversum 2 on the medium wave 747kHz (401m) on Sundays at 1810 GMT (1710 in the summer) and can be heard in England, especially in the South.

Since the program is also being received in many countries – and encouraging reports of excellent data capture have been heard from all of them – the computer part of the programme also carries English explanations.

The question is, this is all very well, but how does it help? Well, Basicode can help you very much if you have access (maybe through friends) to a variety of machines.

A school or college with two or three brands of computer will probably benefit the most. A useful program can then be written which will, hopefully, work on all of them.

Basicode allows most of the usual Basic commands such as ABS( ), CHR$( ), GOTO, LOG( ), DATA, RESTORE, TAN( ) and TAB( ), all of which are handled in the usual way.

Those commands which tend to be very machine dependent, such as CLS (which has other forms on other machines) or A$=GET (which is more usually GET A$), are handled in subroutines, each specific to each machine but at a standard line number.

Thus in place of CLS your program would include the statement GOSUB 100. At line 100 the command appropriate to your machine is included (together with Return of course). This would be CLS on a BBC Micro or Tandy, HOME on the Apple, and so on.

These subroutines, of which there are 12 standard ones, are all between lines 0 and 999 and are written out automatically in your machine when you run Basicode.

Your program can be saved to tape in the standard Basicode protocol which can be read by any other of the 17 machines on the market in the system.

These include the BBC Micro (Models A and B), Apple II, Commodore CBM 3008, 3016, 3032 (new ROMs) CBM 4016, 4032, 8032 and 8096, Commodore 64, Pet 2001 (old ROMs) and Vic 20, DAI Personal Computer, Exidy Sorcerer, OSI, IP-Computer, Philips P 2000, Sharp MZ80A, & K, SWTPC, Tandy TRS-80 Models I and III and the Videogenie.

The manual's description of the language is good, assuming you know Basic, so you will soon be programming quite happily in Basicode.

One improvement I would like to see someone undertake to write for Basicode is a set of standard high resolution graphics commands at standard subroutine line numbers.

This will need a lot of thought and a good knowledge of the capabilities of other machines so that a clever way of transmitting the details of these capabilities is found.

On the text side, Basicode presently assumes that a video displays consists of 24 lines of 40 characters, but requests that only 16 lines are used because many machines will only handle that number.

Clearly this approach to the lowest common denominator cannot be used for good graphics.

● *Unfortunately at the present time Basicode 2 can only be obtained from Holland. We hope to announce price and UK availability in our next issue.*

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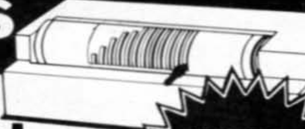

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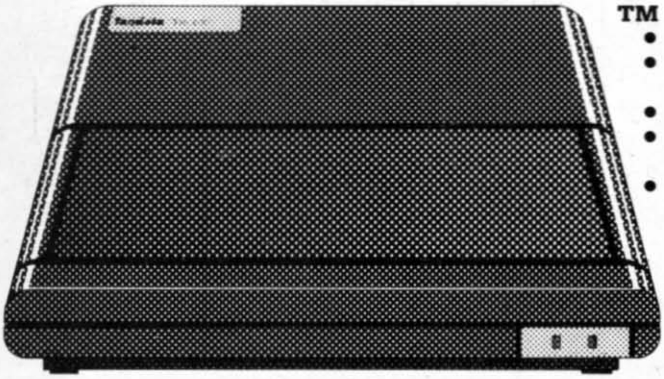

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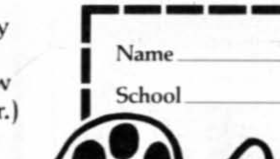

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From Page 35

The other commands make the relevant angler reel in and cast out and obey various instructions.

At the end of the game, the scores and total catches are presented in table form in Mode 7.

The program includes excellent graphics and sound effects.

Program Structure

10-130	Initialisation.
140-640	Calculates fish feeding habits.
650-830	Title page and instructions.
840-1210	Defines graphics and sounds. Draws picture of lake.
1220-1350	Sets up anglers.
1360-1400	Game starts.
1410-1440	Game loop.
1450-1610	Game ends. Score table and opportunity to play again.
1620-1770	Subroutines which draw anglers 1-4 on screen.
1780-1870	PROCcast: casts out.
1880-1990	PROCcalctime: works out when an angler will have next catch.
2000-2070	PROCgameloop: the core of the program.
2080-2320	PROCinterrupt: permits entry and execution of instructions.
2330-2450	PROCreelin: graphics and sound effects for reeling in.
2460-3170	PROCbite: float 'goes under' – user given chance to strike – if successful produces graphics and sound effects of fish being caught – species, weight, points, calculated and displayed – casts out and calculates next catch.
3180-3240	PROChelp: prints a list of command words at the bottom of the screen.
3250-3390	PROCtune: produces the program's jingle.

Variables

ANGLERS:	number of anglers.
ANGLER(3,2):	distance, depth and bait for each angler.
ANGLER$(3):	name of each angler.
A0(9):	utility array used in calculating fish caught.
FISH(9,4):	maximum weight; optimum distance, depth and bait; and points scored for each species.
FISH$(9):	names of each species of fish.
GAMEND:	the TIME when the game must end.
NCATCH(3):	time of each angler's next catch (in terms of LOOP0 – see lines 1410-1440).
OPTIMUM(2):	the optimum distance, depth and bait.
RODPOS(3):	graphics x co-ordinate for the handle of each angler's rod.
SCORE(3,3):	for each angler – number of fish caught, total weight, points gained for the former, points gained for the latter.
NO,N1,S0$, LOOP 0,LOOP1 etc	utility variables used for various purposes

Gone Fishin' listing

```
 10 REM FISHING / A GAME
     FOR UP TO 4 PLAYERS
 20 REM BY DANIEL J. BISHOF
 30 REM VERSION 1.0
 40 REM NEEDS BBC MICRO
     MODEL B
 50 ON ERROR RUN
 60 *FX11.0
 70 DIM FISH$(9).FISH(9
    .4).ANGLER$(3).ANGLER(3
    .2).SCORE(3.3).OPTIMUM(
    2).NCATCH(3).RODPOS(3)
    .A0(9)
 80 DATA 269.525,781,1037
 90 FOR LOOP0=0 TO 3
    : READ RODPOS(LOOP0)
    :NEXT
100 DATA TENCH.CARP.RUDD
    .ROACH.CHUB.PERCH
    .BREAM.PIKE.GUDGEON
    .STICKLEBACK
110 FOR LOOP0=0 TO 9
    :READ FISH$(LOOP0)
    :NEXT
120 DATA 4500.8.9000.7
    .1800.4.1800.3.3100
    .5.1800.6.5800.9.9000
    .10.100.2.15.1
130 FOR LOOP0=0 TO 9
    :READ FISH(LOOP0.0)
    .FISH(LOOP0.4)
    :NEXT
140 REPEAT
150 FOR LOOP0=0 TO 3
160 FOR LOOP1=0 TO 3
170 SCORE(LOOP0.LOOP1)=0
180 NEXT
190 NEXT
200 N0=RND(3)
    :IF N0=3
    THEN FISH(0.1)=1
    ELSE FISH(0.1)=0
210 N0=RND(3)
    :IF N0=3
    THEN FISH(0.2)=1
    ELSE FISH(0.2)=0
220 N0=RND(5)
    :IF N0=4
    THEN FISH(0.3)=1
    :GOTO 240
230 IF N0=5
    THEN FISH(0.3)=2
    ELSE FISH(0.3)=0
240 N0=RND(3)
    :IF N0=3
    THEN FISH(1.1)=0
    ELSE FISH(1.1)=1
250 N0=RND(3)
    :IF N0=3
    THEN FISH(1.2)=1
    ELSE FISH(1.2)=0
260 N0=RND(5)
    :IF N0=4
    THEN FISH(1.3)=1
    :GOTO 280
270 IF N0=5
    THEN FISH(1.3)=2
    ELSE FISH(1.3)=0
280 N0=RND(3)
    :IF N0=3
    THEN FISH(2.1)=0
    ELSE FISH(2.1)=1
290 N0=RND(3)
    :IF N0=3
    THEN FISH(2.2)=0
    ELSE FISH(2.2)=1
300 N0=RND(5)
    :IF N0=4
    THEN FISH(2.3)=1
    :GOTO 320
310 IF N0=5
    THEN FISH(2.3)=2
    ELSE FISH(2.3)=0
320 N0=RND(3)
    :IF N0=3
    THEN FISH(3.1)=0
    ELSE FISH(3.1)=1
330 N0=RND(3)
    :IF N0=3
    THEN FISH(3.2)=0
```

This listing was produced using a special formatter which breaks one program line over several lines of listing. When entering a line don't press Return until you come to the next line number. Full details of the formatter are in the July issue of The Micro User.

Gone Fishin' listing

From Page 99

```
    ELSE FISH(3.2)=1
340 NO=RND(5)
    :IF NO=4
    THEN FISH(3.3)=0
    :GOTO 360
350 IF NO=5
    THEN FISH(3.3)=1
    ELSE FISH(3.3)=2
360 NO=RND(3)
    :IF NO=3
    THEN FISH(4.1)=1
    ELSE FISH(4.1)=0
370 NO=RND(3)
    :IF NO=3
    THEN FISH(4.2)=1
    ELSE FISH(4.2)=0
380 NO=RND(5)
    :IF NO=4
    THEN FISH(4.3)=0
    :GOTO 400
390 IF NO=5
    THEN FISH(4.3)=2
    ELSE FISH(4.3)=1
400 NO=RND(3)
    :IF NO=3
    THEN FISH(5.1)=1
    ELSE FISH(5.1)=0
410 NO=RND(3)
    :IF NO=3
    THEN FISH(5.2)=0
    ELSE FISH(5.2)=1
420 NO=RND(5)
    :IF NO=4
    THEN FISH(5.3)=0
    :GOTO 440
430 IF NO=5
    THEN FISH(5.3)=2
    ELSE FISH(5.3)=1
440 NO=RND(3)
    :IF NO=3
    THEN FISH(6.1)=0
    ELSE FISH(6.1)=1
450 NO=RND(3)
    :IF NO=3
    THEN FISH(6,2)=1
    ELSE FISH(6.2)=0
460 NO=RND(5)
    :IF NO=4
    THEN FISH(6.3)=1
    :GOTO 480
470 IF NO=5
    THEN FISH(6.3)=2
    ELSE FISH(6.3)=0
480 NO=RND(3)
    :IF NO=3
    THEN FISH(7.1)=1
    ELSE FISH(7.1)=0
490 NO=RND(3)
    :IF NO=3
    THEN FISH(7.2)=1
    ELSE FISH(7.2)=0
500 NO=RND(5)
    :IF NO=4
    THEN FISH(7.3)=0
    :GOTO 520
510 IF NO=5
    THEN FISH(7.3)=2
    ELSE FISH(7.3)=1
520 NO=RND(3)
    :IF NO=3
    THEN FISH(8.1)=1
    ELSE FISH(8.1)=0
530 NO=RND(3)
    :IF NO=3
    THEN FISH(8.2)=1
    ELSE FISH(8.2)=0
540 NO=RND(5)
    :IF NO=4
    THEN FISH(8.3)=0
    :GOTO 560
550 IF NO=5
    THEN FISH(8.3)=1
    ELSE FISH(8.3)=2
560 NO=RND(3)
    :IF NO=3
    THEN FISH(9.1)=1
    ELSE FISH(9.1)=0
570 NO=RND(3)
    :IF NO=3
    THEN FISH(9.2)=0
    ELSE FISH(9.2)=1
580 NO=RND(5)
    :IF NO=4
    THEN FISH(9.3)=0
    :GOTO 600
590 IF NO=5
    THEN FISH(9.3)=1
    ELSE FISH(9.3)=2
600 NO=1
    :N1=1
    :N2=1
610 FOR LOOPO=0 TO 9
    : NO=NO+FISH(LOOPO
    .1)
    : N1=N1+FISH(LOOPO
    .2)
    : N2=N2+FISH(LOOPO
    .3)
    :NEXT
620 OPTIMUM(0)=INT (NO/10+0
    .5)
630 OPTIMUM(1)=INT (N1/10+0
    .5)
640 OPTIMUM(2)=INT (N2/10+0
    .5)
650 MODE 7
660 PRINT TAB(15.9):
    CHR$ (133):CHR$ (141):
    "FISHING"
670 PRINT TAB(15.10):
    CHR$ (133):CHR$ (141):
    "FISHING"
680 PRINT TAB(6.12):
    CHR$ (135):"A game
     for up to four people"
690 PRINT TAB(10.14):
    CHR$ (133):"By DANIEL
     J. BISHOP"
700 PROCtune(1)
710 *FX15.0
720 SO$=GET$
730 CLS
    :PRINT CHR$ (133):
    "INSTRUCTIONS"
740 PRINT
    :PRINT "You mav oo
     fishing for up to
     60 minutes.When the
     time limit is up the
     oame ends and the
     score is shown.  Also.
     the oame may be ended
     by using the command
     FINISH"
750 PRINT "Other commands
     which may be used
     while  the oame is
     in progress are: NEAR.
     FAR. TOP. BOTTOM.
     BREAD. WORM. MAGGOT
     and    HELP.  The
     default start values
     are     always far.
     top and maggot."
760 PRINT
770 PRINT "Several commands
     may be strung together
    .in any order."
780 PRINT
790 PRINT "When your float
     goes down. hit the
          spacebar to try
     and catch the fish."
800 PRINT
810 PRINT "Use the spacebar
     to attract the
          computer's attent
    ion, to speed up
         casting, to catch
     fish and to continue
      with the program."
820 *FX15.0
830 SO$=GET$
840 MODE 5
850 ENVELOPE 1.128.11
    ,-1,-2,5,50,5,60,0
    ,-1,-2,60,60
860 ENVELOPE 2,1,0.0,0
    ,0,0,0,2,0,-10,-5
    ,120,0
870 VDU 19.1,4.0,0,0
880 VDU 19,2,7,0,0,0
890 VDU 19.3,2.0.0,0
900 VDU 24,0;160;1279;1023;
910 VDU 28.0.30,19,28
920 VDU 23,224,137,64
    ,20,42,21,64,21,40
930 VDU 23,225,6,6,14
    ,11,25,56,112,224
940 VDU 23,226,0,0,0,0
    ,128,128,192,224
950 VDU 23,227,224,255
    ,255,127,63,0,0,0
960 VDU 23,228,224,224
    ,224,192,128,0,0,0
970 VDU 23,229,0,0,24
    ,60,60,24,0,0
980 VDU 23,230,24,126
    ,126,255,255,126,126
    ,24
990 VDU 23,231,20,62,127
    ,62,127,62,20,0
1000 VDU 23,232,0,56,124
    ,124,124,56,0,0
1010 VDU 23,233,24,60,60
    ,0,0,0,0,0
1020 VDU 23,234,24,48,48
    ,48,48,16,16,0
1030 VDU 23,235,64,32,48
    ,48,48,48,96,0
1040 VDU 23,236,2,4,12
    ,12,12,12,6,0
1050 VDU 23,237,192,192
    ,0,0,0,0,0,0
1060 VDU 23,238,16,4,12
    ,56,146,40,104,16
1070 MOVE 0,1024
    :MOVE 0,400
    :GCOL 0,1
    :PLOT 85,1280,1024
    :PLOT 85,1280,400
1080 MOVE 0,400
    :GCOL 0,3
    :PLOT 85,0,160
    :MOVE 1280,400
    :PLOT 85,1280,160
1090 FOR LOOPO=0 TO 1279
     STEP 5
```

→

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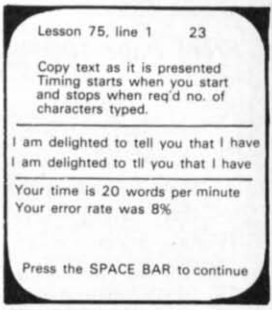

```
Lesson 75, line 1        23

Copy text as it is presented
Timing starts when you start
and stops when req'd no. of
characters typed.

I am delighted to tell you that I have
I am delighted to tll you that I have

Your time is 20 words per minute
Your error rate was 8%

Press the SPACE BAR to continue
```

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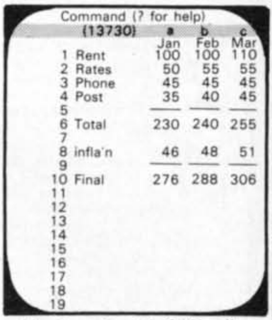

```
      Command (? for help)
         (13730)      a    b    c
                     Jan  Feb  Mar
 1 Rent              100  100  110
 2 Rates              50   55   55
 3 Phone              45   45   45
 4 Post               35   40   45
 5                   ___  ___  ___
 6 Total             230  240  255
 7
 8 infla'n            46   48   51
 9                   ___  ___  ___
10 Final             276  288  306
11
12
13
14
15
16
17
18
19
```

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B10

Gone Fishin' listing

From Page 100

```
1100 MOVE LOOP0.400
     :N0=RND(32)
     :N1=RND(5)-1
     :MOVE LOOP0+N1.400+N0
     :PLOT 85.LOOP0+4.400
1110 NEXT
1120 FOR LOOP0=0 TO 2
1130 IF LOOP0=0
     THEN N0=0
1140 IF LOOP0=1
     THEN N0=820
1150 IF LOOP0=2
     THEN N0=1177
1160 FOR LOOP1=0 TO 10
1170 VDU 5
     :GCOL 0.3
     :MOVE RND(100)+N0
     .RND(80)+400
     :VDU 224,4
1180 NEXT
1190 NEXT
1200 COLOUR 2
     :PRINT "Welcome to
      Lake Beeb"
1210 PROCtune(0)
1220 *FX15.0
1230 INPUT "How many plavers
     ".S0$
1240 ANGLERS=INT (VAL (S0$))
     :IF ANGLERS<1 OR ANGLER
     S>4
     THEN CLS
     :PRINT "1-4 plavers
      onlv!"
     :GOTO 1230
1250 CLS
1260 INPUT "How long (1-60)"
     .S0$
1270 N1=INT (VAL (S0$))
     :IF N1<1 OR N1>60

     THEN CLS
     :PRINT "1-60 minutes
      onlv!"
     :GOTO 1260
1280 GAMEND=6000*N1
1290 FOR LOOP0=0 TO ANGLERS-1
1300 CLS
     :PRINT "What is  vour
      name."
     :PRINT "plaver ";LOOP0+
     1:
     :INPUT S0$
     :IF S0$=""
     THEN GOTO 1300
     ELSE ANGLER$(LOOP0)=
     LEFT$(S0$.9)
1310 ON LOOP0+1 GOSUB 1620
     .1660 .1700 .1740
1320 ANGLER(LOOP0.0)=1
     :ANGLER(LOOP0.1)=1
     :ANGLER(LOOP0.2)=2
1330 PROCcast(LOOP0.1)
1340 PROCcalctime(LOOP0
     .1)
1350 NEXT
1360 CLS
     :PRINT "Good luck!"
1370 *FX15.0
1380 S0$=INKEY$ (300)
1390 CLS
1400 TIME =0
     :LOOP0=1
1410 REPEAT
1420 PROCgameloop
1430 LOOP0=LOOP0+1
1440 UNTIL TIME >GAMEND
      OR S0$="FINISH"
1450 CLS
     :PRINT "Game Over!"
1460 PROCtune(0)
1470 *FX15.0
1480 N0$=INKEY$ (500)
1490 MODE 7
1500 PRINT TAB(8.2):
     CHR$ (134):CHR$ (141):
     "FISHING SCORE TABLE"
1510 PRINT TAB(8.3):
     CHR$ (134):CHR$ (141):
     "FISHING SCORE TABLE"
1520 PRINT
     :PRINT "NAME"."FISH"
     ."WEIGHT"."TOTAL"
     :PRINT
1530 FOR LOOP0=0 TO ANGLERS-1
1540 PRINT ANGLER$(LOOP0)
     .:SCORE(LOOP0.0):"
      fish".:SCORE(LOOP0
     .2):" g"
1550 PRINT TAB(10):SCORE(LOO
     P0.1):" pts".:SCORE(LOO
     P0.3):" pts".:SCORE(LOO
     P0.1)+SCORE(LOOP0
     .3):" pts"
     :PRINT
1560 NEXT
1570 *FX15.0
1580 PRINT
     :INPUT "Do vou wish
      to plav again".S0$
1590 IF S0$<>"Y" AND S0$<>
     "YES"AND S0$<>"N"
      AND. S0$<>"NO"
     THEN GOTO 1490
1600 UNTIL S0$="N" OR S0$=
     "NO"
1610 END
1620 VDU 5
1630 MOVE 224.296
     :GCOL 0.2
     :VDU 225.226
     :MOVE 224.264
     :VDU 227.228
     :MOVE 246.270
     :GCOL 0.0
     :VDU 230
     :MOVE 246.270
     :GCOL 0.2
     :VDU 229
     :MOVE 270.258
     :GCOL 0.0
     :VDU 237
1640 VDU 4
1650 RETURN
1660 VDU 5
1670 MOVE 480.296
     :GCOL 0.0
     :VDU 225.226
     :MOVE 480.264
     :VDU 227.228
     :MOVE 495.270
     :GCOL 0.2
     :VDU 231
1680 VDU 4
1690 RETURN
1700 VDU 5
1710 MOVE 736.296
     :GCOL 0.1
     :VDU 225.226
     :MOVE 736.264
     :VDU 227.228
     :MOVE 753.270
     :GCOL 0.2
     :VDU 232
     :MOVE 751.276
     :VDU 233
1720 VDU 4
1730 RETURN
1740 VDU 5
1750 MOVE 992.296
     :GCOL 0.1
     :VDU 225.226
     :MOVE 992.264
     :VDU 227.228
     :MOVE 1007.275
     :GCOL 0.0
     :VDU 232
1760 VDU 4
1770 RETURN
1780 DEF PROCcast(N0.N1)
1790 SOUND 1,1,200,12
1800 GCOL 0.0
1810 MOVE RODPOS(N0).300
     :DRAW RODPOS(N0).700
1820 GCOL 0.2
1830 IF N1=0
     THEN N1=600
     ELSE N1=950
1840 FOR LOOP1=0 TO 1500
     :NEXT
1850 SOUND 0,-5,6.1
     :SOUND 0.-5,4,1
1860 VDU 5
     :MOVE RODPOS(N0)+100
     .N1
     :VDU 237
     :VDU 4
1870 ENDPROC
1880 DEF PROCcalctime(N0
     .N1)
1890 LOCAL LOOP0.N3
1900 N3=1
1910 FOR LOOP0=0 TO 2
1920 IF OPTIMUM(LOOP0)=ANGLE
     R(N0.LOOP0)
     THEN N3=N3+1
1930 NEXT

1940 NCATCH(N0)=INT (N1+(1/N
     3*20*(RND(1)+0.5)))
1950 LOOP0=0
1960 REPEAT
1970 IF NCATCH(N0)=NCATCH(LO
     OP0) AND N0<>LOOP0

     THEN NCATCH(N0)=NCATCH(
     N0)+1
     ELSE LOOP0=LOOP0+1
1980 UNTIL LOOP0=ANGLERS
1990 ENDPROC
2000 DEF PROCgameloop
2010 CLS
2020 LOOP1=-1
     :REPEAT
     :LOOP1=LOOP1+1
     :UNTIL NCATCH(LOOP1)=LO
     OP0 OR LOOP1=ANGLERS-1
2030 IF NCATCH(LOOP1)=LOOP0

     THEN PROCbite(LOOP1)
2040 *FX15.0

2050 S0$=INKEY$ (300)
2060 IF S0$<>""
     THEN PROCinterrupt
2070 ENDPROC
2080 DEF PROCinterrupt
2090 INPUT "Who is that"
```

→

Gone Fishin' listing

From Page 100

```
1100 MOVE LOOP0,400
     :N0=RND(32)
     :N1=RND(5)-1
     :MOVE LOOP0+N1,400+N0
     :PLOT 85,LOOP0+4,400
1110 NEXT
1120 FOR LOOP0=0 TO 2
1130 IF LOOP0=0
     THEN N0=0
1140 IF LOOP0=1
     THEN N0=820
1150 IF LOOP0=2
     THEN N0=1177
1160 FOR LOOP1=0 TO 10
1170 VDU 5
     :GCOL 0,3
     :MOVE RND(100)+N0
     ,RND(80)+400
     :VDU 224,4
1180 NEXT
1190 NEXT
1200 COLOUR 2
     :PRINT "Welcome to
      Lake Beeb"
1210 PROCtune(0)
1220 *FX15,0
1230 INPUT "How many players
     ",S0$
1240 ANGLERS=INT (VAL (S0$))
     :IF ANGLERS<1 OR ANGLER
     S>4
     THEN CLS
     :PRINT "1-4 players
      only!"
     :GOTO 1230
1250 CLS

1260 INPUT "How long (1-60)"
     ,S0$
1270 N1=INT (VAL (S0$))
     :IF N1<1 OR N1>60

     THEN CLS
     :PRINT "1-60 minutes
      only!"
     :GOTO 1260
1280 GAMEND=6000*N1
1290 FOR LOOP0=0 TO ANGLERS-1
1300 CLS
     :PRINT "What is  your
      name."
     :PRINT "player ";LOOP0+
     1;
     :INPUT S0$
     :IF S0$=""
     THEN GOTO 1300
     ELSE ANGLER$(LOOP0)=
     LEFT$(S0$,9)
1310 ON LOOP0+1 GOSUB 1620
     ,1660 ,1700 ,1740
1320 ANGLER(LOOP0,0)=1
     :ANGLER(LOOP0,1)=1
     :ANGLER(LOOP0,2)=2
1330 PROCcast(LOOP0,1)
1340 PROCcalctime(LOOP0
     ,1)
1350 NEXT
1360 CLS
     :PRINT "Good luck!"
1370 *FX15,0
1380 S0$=INKEY$ (300)
1390 CLS
1400 TIME =0
     :LOOP0=1
1410 REPEAT
1420 PROCgameloop
1430 LOOP0=LOOP0+1
1440 UNTIL TIME >GAMEND
      OR S0$="FINISH"
1450 CLS
     :PRINT "Game Over!"
1460 PROCtune(0)
1470 *FX15,0
1480 N0$=INKEY$ (500)
1490 MODE 7
1500 PRINT TAB(8,2);
     CHR$ (134);CHR$ (141);
     "FISHING SCORE TABLE"
1510 PRINT TAB(8,3);
     CHR$ (134);CHR$ (141);
     "FISHING SCORE TABLE"
1520 PRINT
     :PRINT "NAME","FISH"
     ,"WEIGHT","TOTAL"
     :PRINT
1530 FOR LOOP0=0 TO ANGLERS-1
1540 PRINT ANGLER$(LOOP0)
     ,;SCORE(LOOP0,0);"
      fish",;SCORE(LOOP0
     ,2);" g"
1550 PRINT TAB(10);SCORE(LOO
     P0,1);" pts",;SCORE(LOO
     P0,3);" pts",;SCORE(LOO
     P0,1)+SCORE(LOOP0
     ,3);" pts"
     :PRINT
1560 NEXT
1570 *FX15,0
1580 PRINT
     :INPUT "Do you wish
      to play again",S0$
1590 IF S0$<>"Y" AND S0$<>
     "YES"AND S0$<>"N"
      AND S0$<>"NO"
     THEN GOTO 1490
1600 UNTIL S0$="N" OR S0$=
     "NO"
1610 END
1620 VDU 5
1630 MOVE 224,296
     :GCOL 0,2
     :VDU 225,226
     :MOVE 224,264
     :VDU 227,228
     :MOVE 246,270
     :GCOL 0,0
     :VDU 230
     :MOVE 246,270
     :GCOL 0,2
     :VDU 229
     :MOVE 270,258
     :GCOL 0,0
     :VDU 237
1640 VDU 4
1650 RETURN
1660 VDU 5
1670 MOVE 480,296
     :GCOL 0,0
     :VDU 225,226
     :MOVE 480,264
     :VDU 227,228
     :MOVE 495,270
     :GCOL 0,2
     :VDU 231
1680 VDU 4
1690 RETURN
1700 VDU 5
1710 MOVE 736,296
     :GCOL 0,1
     :VDU 225,226
     :MOVE 736,264
     :VDU 227,228
     :MOVE 753,270
     :GCOL 0,2
     :VDU 232
     :MOVE 751,276
     :VDU 233
1720 VDU 4
1730 RETURN
1740 VDU 5
1750 MOVE 992,296
     :GCOL 0,1
     :VDU 225,226
     :MOVE 992,264
     :VDU 227,228
     :MOVE 1007,275
     :GCOL 0,0
     :VDU 232
1760 VDU 4
1770 RETURN
1780 DEF PROCcast(N0,N1)
1790 SOUND 1,1,200,12
1800 GCOL 0,0
1810 MOVE RODPOS(N0),300
     :DRAW RODPOS(N0),700
1820 GCOL 0,2
1830 IF N1=0
     THEN N1=600
     ELSE N1=950
1840 FOR LOOP1=0 TO 1500
     :NEXT
1850 SOUND 0,-5,6,1
     :SOUND 0,-5,4,1
1860 VDU 5
     :MOVE RODPOS(N0)+100
     ,N1
     :VDU 237
     :VDU 4
1870 ENDPROC
1880 DEF PROCcalctime(N0
     ,N1)
1890 LOCAL LOOP0,N3
1900 N3=1
1910 FOR LOOP0=0 TO 2
1920 IF OPTIMUM(LOOP0)=ANGLE
     R(N0,LOOP0)
     THEN N3=N3+1
1930 NEXT

1940 NCATCH(N0)=INT (N1+(1/N
     3*20*(RND(1)+0.5)))
1950 LOOP0=0
1960 REPEAT
1970 IF NCATCH(N0)=NCATCH(LO
     OP0) AND N0<>LOOP0

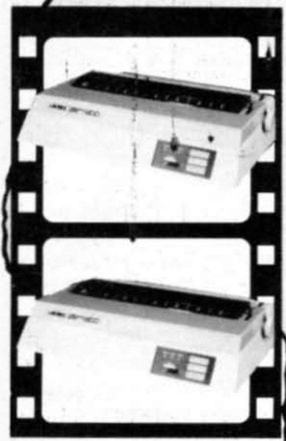
     THEN NCATCH(N0)=NCATCH(
     N0)+1
     ELSE LOOP0=LOOP0+1
1980 UNTIL LOOP0=ANGLERS
1990 ENDPROC
2000 DEF PROCgameloop
2010 CLS
2020 LOOP1=-1
     :REPEAT
     :LOOP1=LOOP1+1
     :UNTIL NCATCH(LOOP1)=LO
     OP0 OR LOOP1=ANGLERS-1
2030 IF NCATCH(LOOP1)=LOOP0

     THEN PROCbite(LOOP1)
2040 *FX15,0

2050 S0$=INKEY$ (300)
2060 IF S0$<>""
     THEN PROCinterrupt
2070 ENDPROC
2080 DEF PROCinterrupt
2090 INPUT "Who is that"
```

→

EXPOSED!



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Gone Fishin' listing

From Page 102

```
     .S0$
2100 S0$=LEFT$(S0$.9)
2110 LOOP1=-1
     :REPEAT
     :LOOP1=LOOP1+1
     :UNTIL ANGLER$(LOOP1)=S
     0$ OR LOOP1=ANGLERS-1
2120 IF ANGLER$(LOOP1)<>S0$

     THEN GOTO 2320
2130 N0=LOOP1
2140 CLS
     :PRINT "OK":
     :INPUT LINE S0$
2150 IF S0$="HELP"
     THEN PROChelp
     :GOTO 2320
2160 IF S0$="FINISH"
     THEN GOTO 2320
2170 N1=ANGLER(N0.0)
2180 S0$=S0$+STRING$(10
     ." ")
2190 N2=0
2200 IF INSTR(S0$."NEAR")>0

     THEN ANGLER(N0.0)=0
     :N2=1
     :GOTO 2220
2210 IF INSTR(S0$."FAR")>0

     THEN ANGLER(N0.0)=1
     :N2=1
2220 IF INSTR(S0$."TOP")>0

     THEN ANGLER(N0.1)=1
     :N2=1
     :GOTO 2240
2230 IF INSTR(S0$."BOTTOM")>
     0
     THEN ANGLER(N0.1)=0
     :N2=1
2240 IF INSTR(S0$."BREAD")>0

     THEN ANGLER(N0.2)=0
     :GOTO 2280
2250 IF INSTR(S0$."WORM")>0
     THEN ANGLER(N0.2)=1
     :GOTO 2280
2260 IF INSTR(S0$."MAGGOT")>
     0
     THEN ANGLER(N0.2)=2
     :GOTO 2280
2270 IF N2=0
     THEN GOTO 2320
2280 PROCreelin(N0.N1)
2290 FOR LOOP1=0 TO 2000
     :NEXT
2300 PROCcast(N0.ANGLER(N0
     .0))
2310 PROCcalctime(N0.LOOP0)
2320 ENDPROC
2330 DEF PROCreelin(N0
     .N1)
2340 IF N1=0
     THEN N1=600
     ELSE N1=950
2350 GCOL 0.1
2360 VDU 5
     :N2=RODPOS(N0)+100
2370 FOR LOOP1=700 TO 451
      STEP -3
2380 SOUND 1,-15,100,0
     :SOUND 1.0.0.1
2390 MOVE RODPOS(N0),700
     :DRAW RODPOS(N0).LOOP1

2400 MOVE INT (N2).INT (N1)
     :GCOL 0.2
     :VDU 237
     :MOVE INT (N2).
     INT (N1)
     :GCOL 0.1
     :VDU 237
2410 IF N2>RODPOS(N0)
     THEN N2=N2-0.4
2420 IF N1>400
     THEN N1=N1-1.7
2430 NEXT
2440 VDU 4
2450 ENDPROC
2460 DEF PROCbite(N0)
2470 IF ANGLER(N0.0)=0

     THEN N1=600
     ELSE N1=950
2480 GCOL 0.1
     :VDU 5
     :MOVE RODPOS(N0)+100
     .N1
     :VDU 237.4
2490 *FX15.0

2500 S0$=INKEY$ ((RND(150)+1
     0))
2510 IF S0$<>""
     THEN GOTO 2560

2520 MOVE RODPOS(N0)+100
     .N1
     :GCOL 0.2
     :VDU 5.237.4
2530 N2=RND(4)
     :IF N2>1
     THEN FOR LOOP1=0
     TO 1500
     :NEXT
     :GOTO 3150
2540 N2=RND(3000)+500
     :FOR LOOP1=0 TO N2
     :NEXT
2550 GOTO 2480
2560 FOR LOOP1=700 TO 440
      STEP -4
2570 SOUND 1,-15,100,0
     :SOUND 1,0,0,1
2580 MOVE RODPOS(N0),700
     :GCOL 0,1
     :DRAW RODPOS(N0).LOOP1
2590 NEXT
2600 N2=100
2610 VDU 5
2620 FOR LOOP1=N1 TO 500
      STEP -2
2630 SOUND 0,-1*RND(5)
     ,100,1
2640 IF N2>0
     THEN N2=N2-0.25

2650 N3=RND(20)+RODPOS(N0)+
     INT (N2)
     :N4=RND(20)+LOOP1
     :N5=RND(20)
2660 GCOL 0,2
     :MOVE N3.N4
2670 IF N5<9
     THEN VDU 224
     :GCOL 0.1
     :MOVE N3.N4
     :VDU 224
2680 IF N5>=9 AND N5<18
     THEN VDU 238
     :GCOL 0,1
     :MOVE N3.N4
     :VDU 238
2690 IF N5=18
     THEN VDU 234
     :GCOL 0.1
     :MOVE N3.N4
     :VDU 234
     :SOUND 0,2,4,3

2700 IF N5=19
     THEN VDU 235
     :GCOL 0.1
     :MOVE N3.N4
     :VDU 235
     :SOUND 0,2,4,3

2710 IF N5=20
     THEN VDU 236
     :GCOL 0,1
     :MOVE N3.N4
     :VDU 236
     :SOUND 0,2,4,3
2720 MOVE N3-40,N4-40
     :GCOL 0,2
     :VDU 237
     :MOVE N3-40,N4-40
     :GCOL 0,1
     :VDU 237
2730 NEXT
2740 GCOL 0,2
     :MOVE N3,N4
     :VDU 235,4
2750 FOR LOOP1=0 TO 9
2760 A0(LOOP1)=0
2770 FOR LOOP2=0 TO 2
2780 IF ANGLER(N0.LOOP2)=FIS
     H(LOOP1.LOOP2+1)
     THEN A0(LOOP1)=A0(LOOP1
     )+1
2790 NEXT
2800 NEXT
2810 N1=A0(1)
2820 FOR LOOP1=1 TO 9
2830 N1=N1+A0(LOOP1)
     :A0(LOOP1)=N1
2840 IF LOOP1=8 OR LOOP1=9

     THEN N1=N1+3
     :A0(LOOP1)=N1
2850 NEXT
2860 N2=RND(N1)
2870 IF N2<=A0(0)
     THEN N2=0
     :GOTO 2970
2880 IF N2<=A0(1)
     THEN N2=1
     :GOTO 2970
2890 IF N2<=A0(2)
     THEN N2=2
     :GOTO 2970

2900 IF N2<=A0(3)
     THEN N2=3
     :GOTO 2970
2910 IF N2<=A0(4)
     THEN N2=4
     :GOTO 2970
2920 IF N2<=A0(5)
     THEN N2=5
     :GOTO 2970
2930 IF N2<=A0(6)
     THEN N2=6
     :GOTO 2970
2940 IF N2<=A0(7)
     THEN N2=7
     :GOTO 2970
2950 IF N2<=A0(8)
     THEN N2=8
```

→

Gone Fishin' listing

From Page 105

```
    :GOTO 2970
2960 N2=9
2970 N1=RND(FISH(N2,0))
2980 FOR LOOP1=0 TO 2
2990 N3=RND(4)
    :IF N3>1
    THEN N1=INT (N1/2)
3000 NEXT
3010 IF N1<1
    THEN N1=1
3020 N3=INT ((N1/100)+0.5)
3030 PRINT ANGLER$(N0);
    " caught"
3040 PRINT "a ";FISH$(N2)
    :PRINT "wt ";N1;"g
     :";N3+FISH(N2,4);
    "pts";
3050 SCORE(N0.0)=SCORE(N0
    .0)+1
3060 SCORE(N0.1)=SCORE(N0
    .1)+FISH(N2,4)
3070 SCORE(N0.2)=SCORE(N0
    .2)+N1
3080 SCORE(N0.3)=SCORE(N0
    .3)+N3
3090 *FX15.0
3100 SO$=INKEY$ (800)
3110 GCOL 0.1
    :PLOT 0,-64,0
    :VDU 5.235.4
3120 *FX15.0
3130 SO$=INKEY$ (300)
3140 PROCcast(N0,ANGLER(N0
    .0))
3150 PROCcalctime(N0.LOOP0)
3160 CLS
3170 ENDPROC
3180 DEF PROChelp
3190 CLS
    :COLOUR 3
    :PRINT "Commands:";
3200 COLOUR 2
    :PRINT " NEAR FAR
     TOP BOTTOM BREAD
       WORM MAGGOT FINISH";
3210 *FX15.0
3220 SO$=INKEY$ (2000)
3230 CLS
3240 ENDPROC
3250 DEF PROCtune(N0)
3260 ENVELOPE 3.128.0.0
    .0.0.0.0,12,-2,-1
    ,-2,126.106
3270 DATA 121.1,129.1,137
    .1,145.2,145.2,145
    .1,117,1,121,1,129
    .1,137,2,137,2
3280 DATA 137.1.109.1.117
    .1.121,1,129.2,129
    ,2,129,1,129.1,121
    .1,117,1,109.1
3290 IF N0=0
    THEN N0=11
    :RESTORE 3280
3300 IF N0=1
    THEN N0=22
    :RESTORE 3270
3310 FOR LOOP0=1 TO N0
3320 IF LOOP0=22
    THEN N3=255
    ELSE N3=2
3330 READ N1.N2
3340 SOUND 0.3,3.N3
3350 SOUND 1.3.N1,N3
3360 FOR LOOP1=0 TO 300*N2
    :NEXT
3370 NEXT
3380 FOR LOOP1=0 TO 2500
    :NEXT
3390 ENDPROC
```

This listing is included in this month's cassette tape offer. See order form on Page 93.

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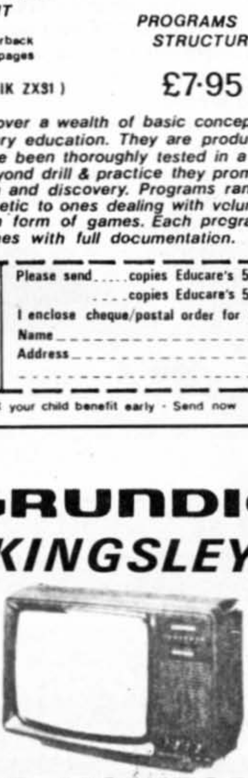

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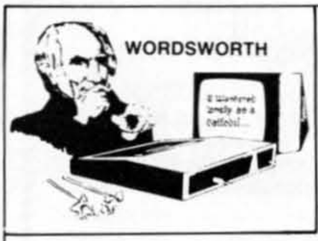

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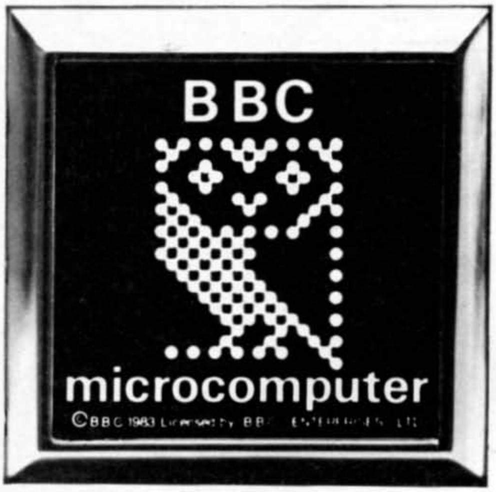

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From Page 63

```
     ,255,240,0
3160 VDU 23,234,255,255,255,255,255
     ,240,0,0
3170 VDU 23,235,252,254,254,255,240
     ,0,0,0
3180 VDU 23,255,255,255,255,255,255
     ,255,255,255
3190 Fgnd%=Black%
3200 OrigY%=704
3210 FOR OrigX%=0 TO 224 STEP 32
3220 PROCdraw_row(OrigX%,OrigY%)
3230 OrigY%=OrigY%-64
3240 NEXT
3250 ENDPROC
3260 REM
4000 REM ** DRAW ONE ROW OF BOARD
     **
4010 DEF PROCdraw_row(OX%,OY%)
4020 REM alternate foreground
4030 Fgnd%=3-Fgnd%
4040 FOR I=1 TO 8
4050 PROCdraw_square(OX%,OY%)
4060 OX%=OX%+128
4070 OY%=OY%+16
4080 NEXT
4090 ENDPROC
4100 REM
5000 REM ** DRAW A SINGLE SQUARE
     **
5010 DEF PROCdraw_square(X%,Y%)
5020 REM Invert foreground colour
5030 GCOL 0,Fgnd%
5040 Fgnd%=3-Fgnd%
5050 MOVE X%,Y%
5060 VDU 224,225,226,227,228
5070 VDU 8,8,8,8,8,10
5080 VDU 229,255,255,255,230
5090 VDU 8,8,8,8,8,10
5100 VDU 231,232,233,234,235
5110 ENDPROC
5120 REM
6000 REM *** Draw the major pieces
     ***
6010 DEF PROCdraw_pieces(Col%,X%
     ,Y%)
6020 PROCrook
6030 PROCknight
6040 PROCbishop
6050 PROCqueen
6060 PROCking
6070 PROCbishop
6080 PROCknight
6090 PROCrook
6100 ENDPROC
6110 REM
7000 REM *** ROOK ***
7010 DEF PROCrook
7020 PROCclear
7030 REM shape
7040 VDU 23,228,0,0,0,27,31,31,15
     ,15
7050 VDU 23,229,0,0,0,216,248,248
     ,240,240
7060 VDU 23,230,7,7,7,7,7,7,7,7
7070 VDU 23,231,224,224,224,224,224
     ,224,224,224
7080 VDU 23,232,15,15,31,63,63,31
     ,15,0
7090 VDU 23,233,240,240,248,252,252
     ,248,240,0
7100 REM highlight
7110 VDU 23,236,0,0,0,0,64,64,64
     ,64
7120 VDU 23,237,0,128,128,128,128
     ,128,128,128
7130 VDU 23,238,192,64,96,32,48,0
     ,0,0
7140 REM outline
7150 VDU 23,243,0,0,31,36,32,32,16
     ,16
7160 VDU 23,244,0,0,248,36,4,4,8
     ,8
7170 VDU 23,245,8,8,8,8,8,8,8,8
7180 VDU 23,246,16,16,16,16,16,16
     ,16,16
7190 VDU 23,247,16,16,32,64,64,32
     ,16,15
7200 VDU 23,248,8,8,4,2,2,4,8,240
7210 PROCdraw_piece
7220 ENDPROC
7230 REM
8000 REM *** KNIGHT ***
8010 DEF PROCknight
8020 PROCclear
8030 REM shape
8040 VDU 23,226,0,0,0,0,1,3,3,7
8050 VDU 23,227,0,0,0,0,0,0,192,240
8060 VDU 23,228,15,31,31,63,63,63
     ,63,31
8070 VDU 23,229,252,252,240,248,128
     ,192,224,240
8080 VDU 23,230,31,31,15,7,7,31,31
     ,15
8090 VDU 23,231,248,252,252,248,240
     ,248,248,240
8100 VDU 23,232,15,63,127,127,127
     ,63,15,0
8110 VDU 23,233,240,252,254,254,254
     ,252,240,0
8120 REM highlights
8130 VDU 23,235,0,0,0,0,0,0,0,64
8140 VDU 23,236,0,0,0,0,0,0,128,128
8150 VDU 23,237,192,64,96,32,0,0
     ,0,64
8160 VDU 23,238,96,32,48,16,0,0,0
     ,0
8170 REM outline
8180 VDU 23,241,0,0,0,1,2,4,4,8
8190 VDU 23,242,0,0,0,0,128,192,48
     ,12
8200 VDU 23,243,16,32,32,64,64,64
     ,64,32
8210 VDU 23,244,2,2,12,4,120,32,16
     ,8
8220 VDU 23,245,32,32,16,8,24,32
     ,32,16
8230 VDU 23,246,4,2,2,4,8,4,4,8
8240 VDU 23,247,48,64,128,128,128
     ,64,48,15
8250 VDU 23,248,12,2,1,1,1,2,12,240
8260 PROCdraw_piece
8270 ENDPROC
8280 REM
9000 REM *** BISHOP ***
9010 DEF PROCbishop
9020 PROCclear
9030 REM shape
9040 VDU 23,226,0,0,0,0,0,1,3,3
9050 VDU 23,227,0,0,0,0,0,128,128
     ,0
9060 VDU 23,228,6,6,15,15,15,3,3
     ,7
9070 VDU 23,229,96,224,240,240,240
     ,192,192,224
9080 VDU 23,230,31,3,3,3,3,7,7,7
9090 VDU 23,231,248,192,192,192,192
     ,224,224,224
9100 VDU 23,232,15,31,63,63,63,31
     ,15,0
9110 VDU 23,233,240,248,252,252,252
     ,248,240,0
9120 REM highlight
9130 VDU 23,236,0,64,64,96,0,0,0
     ,0
9140 VDU 23,237,0,0,128,128,128,128
     ,128,192
9150 VDU 23,238,64,64,96,32,0,0,0
     ,0
9160 REM outline
9170 VDU 23,241,0,0,0,0,1,2,4,4
9180 VDU 23,242,0,0,0,0,128,64,64
     ,224
9190 VDU 23,243,9,9,16,16,16,12,4
     ,24
9200 VDU 23,244,144,16,8,8,8,48,32
     ,24
9210 VDU 23,245,32,28,4,4,4,8,8,8
9220 VDU 23,246,4,56,32,32,32,16
     ,16,16
9230 VDU 23,247,16,32,64,64,64,32
     ,16,15
9240 VDU 23,248,8,4,2,2,2,4,8,240
9250 PROCdraw_piece
9260 ENDPROC
9270 REM
```

```
10000 REM ** NULL CHARACTERS **
10010 DEF PROCclear
10020 REM produce clear areas for
10030 REM rook, knight and bishop
10040 FOR Char%=224 TO 242
10050 VDU 23,Char%,0,0,0,0,0,0,0,0
10060 NEXT
10070 ENDPROC
10080 REM
11000 REM *** QUEEN ***
11010 DEF PROCqueen
11020 REM DEFINE 4 CHARS FOR HEAD
11030 VDU 23,224,0,0,0,0,1,3,3,7
11040 VDU 23,225,0,0,0,0,128,192,192
      ,224
11050 VDU 23,226,63,63,31,15,7,7,3
      ,3
11060 VDU 23,227,252,252,248,240,224
      ,224,192,192
11070 REM DEFINE 2 CHARS FOR HIGHLIGHTS
11080 VDU 23,234,0,0,0,0,0,128,0,0
11090 VDU 23,235,168,0,64,192,128
      ,128,0,0
11100 REM DEFINE 4 CHARS FOR OUTLINE
11110 VDU 23,239,0,0,0,1,2,4,4,56
11120 VDU 23,240,0,0,0,128,64,32,32
      ,28
11130 VDU 23,241,64,64,32,16,8,8,4
      ,4
11140 VDU 23,242,2,2,4,8,16,16,32
      ,32
11150 PROCroyal_base
11160 PROCdraw_piece
11170 ENDPROC
11180 REM
12000 REM *** KING ***
12010 DEF PROCking
12020 REM DEFINE 4 CHARS FOR HEAD
12030 VDU 23,224,0,1,3,3,1,1,3,7
12040 VDU 23,225,0,128,192,192,128
      ,128,192,224
12050 VDU 23,226,31,31,15,15,7,7,3
      ,3
12060 VDU 23,227,248,248,240,240,224
      ,224,192,192
12070 REM DEFINE 2 CHARS FOR HIGHLIGHTS
12080 VDU 23,234,0,0,128,128,0,0,0
      ,0
12090 VDU 23,235,96,0,64,64,192,128
      ,128,0
12100 REM DEFINE 4 CHARS FOR OUTLINE
12110 VDU 23,239,1,2,4,4,2,2,4,24
12120 VDU 23,240,128,64,32,32,64,64
      ,32,24
12130 VDU 23,241,32,32,16,16,8,8,4
      ,4
12140 VDU 23,242,4,4,8,8,16,16,32
      ,32
12150 PROCroyal_base
12160 PROCdraw_piece
12170 ENDPROC
12180 REM
13000 REM ** BOTTOM OF KING AND QUEEN
       *
13010 DEF PROCroyal_base
13020 REM DEFINE 6 CHARS FOR SHAPE
13030 VDU 23,228,7,31,3,3,3,3,3,3
13040 VDU 23,229,224,248,192,192,192
      ,192,192,192
13050 VDU 23,230,7,7,7,7,15,15,31
      ,63
13060 VDU 23,231,224,224,224,224,240
      ,240,248,252
13070 VDU 23,232,63,63,127,127,127
      ,63,31,0
13080 VDU 23,233,252,252,254,254,254
      ,252,248,0
13090 REM DEFINE 3 CHARS FOR HIGHLIGHTS
13100 VDU 23,236,0,0,0,0,128,128,128
      ,128
13110 VDU 23,237,128,192,64,64,64
      ,64,32,32
13120 VDU 23,238,32,48,48,24,24,0
      ,0,0
13130 REM DEFINE 6 CHARS FOR OUTLINE
13140 VDU 23,243,24,32,28,4,4,4,4
      ,4
13150 VDU 23,244,24,4,56,32,32,32
      ,32,32
13160 VDU 23,245,8,8,8,8,16,16,32
      ,64
13170 VDU 23,246,16,16,16,16,8,8,4
      ,2
13180 VDU 23,247,64,64,128,128,128
      ,64,32,31
13190 VDU 23,248,2,2,1,1,1,2,4,248
13200 ENDPROC
13210 REM
14000 REM *** DRAW A PIECE ***
14010 DEF PROCdraw_piece
14020 REM select colour, move to start
14030 GCOL 0,Col%
14040 MOVE X%,Y%
14050 REM draw shape
14060 VDU 224,225,8,8,10,226,227,8
      ,8,10,228,229,8,8,10,230,231
      ,8,8,10,232,233
14070 REM change to white for highlight
14080 GCOL 0,3
14090 MOVE X%,Y%
14100 VDU 9,234,8,10,235,8,10,236
      ,8,10,237,8,10,238
14110 REM now cyan for outline
14120 GCOL 0,1
14130 MOVE X%,Y%
14140 VDU 239,240,8,8,10,241,242,8
      ,8,10,243,244,8,8,10,245,246
      ,8,8,10,247,248
14150 REM adjust origin for next piece
14160 X%=X%+128
14170 Y%=Y%+16
14180 ENDPROC
14190 REM
15000 REM ** DEFINE PAWN-SHAPE **
15010 DEF PROCdef_pawn
15020 REM main shape
15030 VDU 23,224,0,0,0,0,0,1,3,7
15040 VDU 23,225,0,0,0,0,0,128,192
      ,224
15050 VDU 23,226,7,3,1,7,1,1,3,3
15060 VDU 23,227,224,192,128,224,128
      ,128,192,192
15070 VDU 23,228,7,7,15,31,31,31,15
      ,0
15080 VDU 23,229,224,224,240,248,248
      ,248,240,0
15090 REM highlight
15100 VDU 23,230,0,0,0,0,0,0,0,192
15110 VDU 23,231,128,0,0,0,0,0,0,128
15120 VDU 23,232,128,128,192,64,96
      ,0,0,0
15130 REM outline
15140 VDU 23,233,0,0,0,0,1,2,4,8
15150 VDU 23,234,0,0,0,0,128,64,32
      ,16
15160 VDU 23,235,8,4,6,8,6,2,4,4
15170 VDU 23,236,16,32,96,16,96,64
      ,32,32
15180 VDU 23,237,8,8,16,32,32,32,16
      ,15
15190 VDU 23,238,16,16,8,4,4,4,8,240
15200 ENDPROC
15210 REM
16000 REM *** DRAW A PAWN ***
16010 DEF PROCdraw_pawn(Col%)
16020 REM select position and colour
16030 MOVE OrigX%,OrigY%
16040 GCOL 0,Col%
16050 REM draw shape
16060 VDU 224,225,8,8,10,226,227,8
      ,8,10,228,229
16070 REM highlight
16080 GCOL 0,3
16090 VDU 8,11,11,230,8,10,231,8,10
      ,232
16100 REM outline
16110 MOVE OrigX%,OrigY%
16120 GCOL 0,1
16130 VDU 233,234,8,8,10,235,236,8
      ,8,10,237,238
16140 REM re-position for next pawn
16150 OrigX%=OrigX%+128
16160 OrigY%=OrigY%+16
16170 pawns_drawn=pawns_drawn+1
16180 ENDPROC
16190 REM
16200 REM **** End of program ****
```

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MICROMAIL

PROCede with caution when spurning GOTO

DEAR Micro User,

PROCletter : PROCname of writer:END

DEFPROCletter: I am getting a little tired of hearing the cries of the inane structuralist whenever programming comes to the fore.

It seems that there are two sets of programmers at large, those who shudder at the thought of using anything but a PROC statement, and those, possibly reared on "inferior" Basic, who fill their programs with GOTOs and GOSUBs like they were confetti.

An analysis of which technique is the better has led me to the following conclusions.

The all-GOTO approach is obviously incapable of being used in long programs as you need to keep checking where the program is going next . . . it can end up like Spaghetti Junction in the listing.

Now the all-PROC man is just as foolish, as he will swear that under no circumstances must anything other than a PROC be used. Ten years with a ZX81 is the usual punishment. (Your faint-hearted micro user of the August 1983 edition appears to have encountered such a fellow.)

To use PROCs ALL the time is, I have found, totally beyond reason.

I have written this letter in such a manner, where there is no need to have used any PROCs . . . as you can see they clog up the visual running order and one has to check all the DEFPROCs to see what the actual program looks like.

In the end you are going back and forth through the program as if you'd used GOTOs in the first place.

Also having to use three commands instead of one (PROC, DEFPROC and ENDPROC or GOTO) is a waste of vital program space, and in a game like your King Kong (April issue) can even lead to "No room."

Now from personal programming experience just hear this: I am currently writing a piece of software and had written the entire "order" of the program in one line of PROCs, like the top of this letter, and was then defining each PROC in turn.

However, when I came to change mode in a PROC I got "Bad mode". So I then put the mode changes in between the PROC statements.

OK so far. But then I had to use the VDU5 command, and overlap several shapes in different colours. Because it was used inside a PROC definition it now refused to either change mode OR go into VDU5.

If I were to put the VDU5 outside the PROC, I'd have had to split one PROC into two. The situation was obviously hopeless. PROCs had let me down.

Is this usual for them to "refuse" certain commands? My remedy was to scrub the "extra" line I'd used at the start for all the PROCs, which was gradually getting longer and longer, and all the wasteful DEFPROCs and ENDPROCs!

Now I could change mode whenever I felt like it, and use VDU5. However, not wishing to be an extremist, I included a few PROCs that were necessary, as they did repetitive actions.

I never use a PROC for the sake of it, like some seem to do.

This time I only use them for time loops, etc (for example PROCt(500)). And as for GOTOs, they are excellent at handling inputs – if the input doesn't equal 'Yes' or 'No', GOTO the line where it asks the input question again, for instance.

I've never had any problems with them at that level.

The point is not to swear by any method, but to use either command in its proper place. Both are necessary. That is why both are in the Basic.

Why do you think GOTOs and GOSUBs are in, otherwise, Mr. Structuralist? ENDPROC

DEFPROCname_of_writer

– **Christopher Hester, West Yorks.**

● The reason mode change won't work inside the PROC definition is that it would destroy the basic stack which is situated just below HIMEM.

As to your query about VDU5, the answer is that we don't know why it won't work for you. It does for us!

Take the blue viewpoint

WHEN using Mode 0 I suggest readers change the colour of the background to white and the foreground to blue by using VDU19 to redefine the white and black, as it is much easier to read and better for the eyes than the normal Mode 0.

It's great to be able to use the sound facility but often in arcade type games the volume is much too high even with a large book over the speaker – and it's a shame to switch it off.

Why can't the games writers allow you to change the volume or at least turn it down?

Many schools, including mine, have both a BBC and a 380Z Research machine. Is there any way in which you can use the 380Z disc drives with the BBC without it costing too much?

Can you recommend an efficient compiler?

And, finally, is a Cobol version for the BBC likely to appear in the near future? – **Simon Taurins, Llanelen, Gwent.**

● If you open up your BBC Micro you will find in the bottom left hand corner a printed circuit board on which is a small blue plastic block. If you examine this you will find there is a small screwdriver slot – this is a volume control and may be used to turn the volume down.

As to your second question, we know of no one using the BBC disc drives with the 380Z research machine without it costing too much.

There is as yet no full compiler for the BBC Micro, but Acornsoft are working on Cobol for the Beeb. No release date has been announced.

The speedy one

I HAVE recently become interested in machine code for the BBC Micro.

I have now managed to attain a decent standard in programming machine code and can use Mode 7 graphics, but have found it very difficult to use machine code graphics in the hi-res modes without the use of the OS, which is too slow.

Could you do a series of articles on machine code graphics in hi-res modes without using the OS and also incorporate sound without the OS?

Finally, I would like to add

→

From Page 113

that I feel your article on King Kong was a little trivial. When writing an arcade style game in Basic it is usually far faster if most of the program is written in a less structured manner.

Contrary to popular belief, the GOSUB command on the Beeb is faster than the PROC command.

Also why waste memory making a PROC for slowing down when a FOR . . . NEXT loop can be used?

The PROC uses a lot of memory to be defined and then the actual call is large too. – **Barry Wakelin, Greatham, Hants.**

● A machine code course which will cover your requirements is currently being written for us.

It will cover most of the points you require, as will Acornsoft's forthcoming book "Creative Assembler".

The author of King Kong thoroughly agrees with you. After all the object of the exercise was to produce an enjoyable, exciting game, which he achieved.

Having said that, some still prefer us to publish structured programs – they're easier to debug!

Cassette specifications

ACORN Computers have asked us to pass onto our readers their following reply to a letter "indirected" through Micromail:

THE specifications of the cassette interface of the BBC computer, and for reference our data recorder, are as follows:

BBC Computer

Output impedance < 1k ohms

Input impedance > 100k ohms

Output level nominal 200mV P-P

Dynamic input range nominal 50mV – 5V P-P

BBC Data Recorder

Output impedance < 1k ohms

Input impedance =40k ohms

Output level nominal 275mV RMS

Input signal range 6mV – 200mV RMS

We were well aware during our work on the BBC computer design that people would wish to use many different types of casette recorder with their computers and that they would need some means to test and set the correct level.

After much thought it was decided not to provide the signal level specification, as it was felt that this would cause some confusion with a large number of our customers (with particular problems caused by figures given for various recorders in dB,RMS or peak-to-peak values).

Instead it was decided to provide the section on the beginning of the Welcome cassette in the hope that people would be able to adjust the volume controls of their recorders to set the correct level.

This was based on the observation that the cheapest recorders always seem to work once the correct signal levels have been set. – **Mike Bicknell, Customer Service Manager, Acorn Computers.**

In praise of tape

I WRITE to defend the BBC Micro's much-criticised cassette system, and hope my experiences will be of help to readers.

I have the Model A with the 0.10 OS. This, together with the fact that I use a combined radio-cassette with twin speakers, is generally considered to be a bad choice.

However, I previously used a 7-pin Din with two 3.5mm jack plugs, and found I could only load programs – sometimes unsuccessfully.

I later bought two 5-pin Din plugs, and can now load and save perfectly.

I use TDK ferric oxide tapes – the cheapest – and have never failed to load or save programs.

Not only that, but the radio/cassette can be at any volume, either minimum or maximum.

The tone control also makes no difference to loading or saving.

I have also found that I cannot load or save programs with the more expensive chromium dioxide tapes. – **Ewan MacLeod, Stewarton, Ayrshire.**

Overpriced at £400?

I AM going to buy a micro in the near future. At the moment I am looking at the BBC Model B.

Apart from its excellent graphics, I want a machine that eventually I could use as a word processor – not to mention educational software for the kids.

However the Beeb looks a trifle overpriced at £400. Now that the Commodore 64 is almost half the price, I can't believe that the Beeb is twice as good.

The Memotech MTX512 looks good too from what one can see from the pre-release reviews.

How will it shape up next to the BBC? How much longer can Acorn (or is it the BBC?) keep the price so high?

Do you expect the price to drop – say before Christmas?

On a different tack, are "sprites" and "user-defined" graphics the same animal? – **Martin Crawley, Isleworth, Middlesex.**

● The BBC Micro is worth every penny you pay for it. Far from being overpriced it is underpriced and we can see little chance of its price coming down in the future, unless some of the High Street stores start discounting.

The low profit margins of the BBC Micro make that unlikely.

Sprites bear some resemblance to user defined characters but are far cleverer beasties.

Rampant robot

MAY I be the millionth person to congratulate you on the high quality of your excellent magazine.

Inspired by your review of "Countdown to Doom" the adventure game by Acornsoft, I bought it.

Now I know that one gets a crib sheet with the game but I'm absolutely stuck.

Even with their cryptic clues, I have been unable to deactivate the robot.

When I bought my Beeb I was determined not to become addicted to playing games, but would get down to the finer parts of programming.

Anyway, you have been indirectly responsible for my predicament, so I wonder if you will publish this plea for help. – **M.B. Hollands, Warminster, Wiltshire.**

● If any reader who knows how to de-activate the robot would write to us we'll pass the replies to Mr Hollands.

Way with strings

CAN you help me with this problem please? I always compile an index page for my discs which is !BOOTed.

The page shows names in full, but when a program is

→

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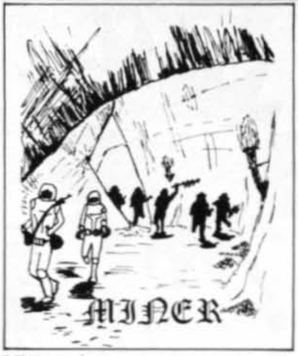

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MICROMAIL

From Page 114

selected the program CHAINS the first seven letters.

Recently I bought an RX-80 Epson printer.

It would be much more convenient to LOAD from the disc as I often have to edit the programs before running, for example, I keep letterheads on the disc.

But I cannot replace CHAIN by LOAD – it prints just syntax error. There must be a way of overcoming this. – **R.Y. McNulty, Northampton.**

● Unfortunately you can CHAIN a string but you cannot LOAD it, so CHAIN A$ will work but LOAD A$ will not.

Believe it or not, our editor came to the rescue. Set up a function key with the OSCLI routine that contains "LOAD" + A$, then "press" that key with a *FX138. The User Guide contains the details, OS 1.0 and above.

We're going to be giving full details in a future article describing an interesting disc utility.

Building the Buggy

THE review by Mike Cook in The Micro User in August this year compares the Edinburgh Turtle to the Economatics/BBC Buggy, which is constructed using elements of Fischertechnik of which we are the manufacturer.

While the article may make a number of points concerning the technical applications of a Buggy about which we are not able to comment, we would like to make a point regarding a statement made on the first page of the article.

Mr Cook says: "In contrast to the precision engineered Turtle, the Buggy gives the impression of being made from a child's construction set – which it was!"

Fischertechnik may well be designed for use by children, but to dismiss it as a simple child's toy is unfair, to say the least.

Fischertechnik parts are manufactured to the highest standard and most precise tolerances.

The kits are used widely in schools and universities as a teaching aid for CDT studies and even in industry where they are used to test design principles and layouts at a very high and precise level.

Fischertechnik was chosen for use in the BBC Buggy after careful consideration by the BBC, the MEP and Economatics, the ultimate manufacturers of the whole Buggy, only after we were able to prove to everyone's satisfaction that Fischertechnik can maintain the precision required for an instrument such as the Buggy.

The Edinburgh Turtle is designed and built in an entirely different manner to the BBC Buggy.

One of the important points about this is that it is to be constructed by the purchaser himself, and this in itself is a valuable part of the exercise.

Some of the problems experienced by Mr Cook are quite possibly the result of construction from the kit, and resolving these would be an important part of the exercise for a purchaser of the BBC Buggy.

To sum up the BBC Buggy, being constructed from Fischertechnik, is not only engineered with great precision, but also allows the purchaser to use his own experience in further developing his capabilities. – **Martin Thomas, marketing manager, Artur Fischer (UK) Ltd.**

● A review is a record of the impression gained of a new product, not a free advertisement. We have a duty to our readers to explain how the product comes across in an unbiased yet entertaining manner.

I stand by the decision to review the two buggies in one article as I do not think that there will be many schools who will be able to purchase both and so, by definition, they will be rivals.

The number of points that "need clearing up" seem mostly to agree with what I said, except that they are couched in glowing salesman-like terms, but let me clarify where we differ.

The software supplied with the BBC buggy was, in my opinion, quite poor. This was the result of over-production. The programs promised more than they delivered.

They were confusing to operate and when I finally worked it all out I was left with the feeling, "Oh is that all it does".

This was also the opinion of about 10 teachers to whom I showed it.

I know it would have been easy to drive the buggy with a background task, so why was one of the programs not constructed to demonstrate this? You seem to think the teachers incapable of understanding it would be capable of writing it!

The shortfall in the rotation was not due to faulty construction, as it was cumulative. Therefore after several rotations it was 180 degrees out.

When the test program unwound it however, the over rotation in the other direction cancelled this out and the Buggy ended up pointing in roughly the correct direction.

I did try to remove the bumper but it would not be removed, it just went limp and floppy.

The buggy had been assembled by a post-graduate student teacher, so I suppose that children will do better.

None of the teachers who saw the buggy in action were impressed with it. I think the trouble is that, like the software, it promises more than it delivers.

Mike Cook

No link

I HAVE a BBC Micro at home and one at my business.

I would be grateful if you would advise me of the most economical method for transferring the contents of discs between one and the other by telephone.

The user manual hints that both Prestel and Econet add-on units will do this, but the details are not specific. – **D.A.G. King, Wrotham Heath, Kent.**

● Prestel or Econet both involve a type of downloading, but not of the sort you require.

As yet there is no method of transferring programs directly from one micro to the other via the telephone.

Specialist groups

THE British Primary Health Care Group is anxious to help co-ordinate the efforts of all those who are finding uses for BBC computers in general practice and primary care.

We hope to try and prevent the inevitable duplication that will occur, by setting up a subgroup to run a medical software library, assist novices, and run meetings around the country.

The library programs will be available free to members. Typically they will be small practice accounting packages, morbidity analysers, rotas, and small databases for vaccination recall. Membership will be £6 a year including bi-monthly newsletter.

Anyone interested in joining, or more importantly, participating in this group, please contact: Dr R.H. Board, BBC Group Organiser, Carisbrooke House, Stockleigh Road, St. Leonards on Sea, E. Sussex TN38 0JP. – **Dr N. Robinson, PHCG secretary.**

● Nice to hear of the formation of a specialist user group. If anyone has formed any other special groups (or wants to) please let us have details.

→

MICROMAIL

DFS changes

I HAVE read with interest your review of disc filing systems in the September issue of The Micro User. I would like to thank Jim Notman and Chris Martin for the fair way in which they both treated the subject.

I would, however, like to point out that the Amcom DFS that was reviewed was one of a very early batch and certain important aspects have been considerably improved since the review was carried out.

The most significant change to the Amcom DFS has been the removal of the heavy error checking while handling random access files to bring it into line with other disc filing systems presently available.

This has allowed for considerable increases in the speed of the system.

*When the DFS was originally conceived we considered including an *ACCESS command, but concluded that it could be dangerous to allow the global locking and unlocking of files indiscriminately, therefore the *ACCESS command was omitted.*

However due to popular demand we have now included this command in the Amcom DFS.

The random access file handling routines have also been tidied up somewhat, for instance the OSGBPB calls now function in a standard manner (including OSGBPB 8 which Jim Notman so observantly noticed was missing).

Locked files can now be read into memory, so Wordwise will now function happily with this DFS (the reduction in error checking has also greatly speeded up saving and loading of Wordwise files).

This DFS can also handle up to five open files in the same manner as the Acorn DFS.

**COPY is, and always has been, able to copy files from more than one directory at once. For instance all files beginning with a "W" may be copied regardless of their directory by typing *COPY 0 1 #W*.*

*The Amcom DFS can *RUN a program from a different directory without the full file specification although in some circumstances the file name may need to be in inverted commas to avoid ambiguity with other commands.*

*The reason *CAT does not give an alphabetical listing of the files on the disc is because with page set at &1500 as opposed to Acorn's &1900 there is no longer space to alphabeticalise the file names, especially in extended mode where there are up to 63 file names.*

We believe that an extra 1k of user memory is more important than having the catalog in alphabetical order.

Finally if anyone who purchased an early version of this DFS would like to have it exchanged for the current version, please contact our customer service department for a replacement. – **Kevin Gibson, Technical Director, Pace Software Supplies.**

Anon . . .

JUST a minor moan. I wrote your last two games of the month – Fruities and Robin and Marian but you didn't print my name on either of them. Yours sincerely –

● Sorry about that, but our typesetting machine just won't print Still thanks for the games!

And finally, with tongue firmly in cheek . . .

Day the Beeb struck back

Dear Trev

I write to you in pain, a convalescent newly-emerged from a hospital bed like a butterfly from a chrysalis (or a bluebottle from rotting meat, as Andrea might say).

It was nothing serious, just one of those silly accidents. I was up in the spare room "playing" with my Beeb (as A would put it), running a rather nasty games program called Vet in which you have to catch and neuter cats before they breed and overwhelm you.

I was trying to take the cassette out of its player and I knocked the case over the other side of the table.

Without thinking I went to get it and tripped over the Beeb's electric flex which A had tidied up earlier without telling me.

The result was two broken fingers on my left hand, a couple of cracked ribs and a nasty bang on the head. A found me unconscious on the floor. She says that she left me for a while because she thought I was worshipping the Beeb, but I don't believe her.

Anyway, the result was a couple of days in the local general hospital for observation and it was not without incident. Despite being groggy I was sitting up in bed trying to read The Micro User, fascinated by the way the listings were scrolling, and a nurse saw what I was reading.

"Oh, are you one of those microchip people who're going to put us all out of work?" she asked.

Before I could reply she stuck a thermometer in my mouth, took my pulse and walked away saying, with a most un-Nightingale smirk, "Well, get your computer to take you to the loo, then."

Actually she was quite nice, which is more than I can say for Andrea. Apparently she'd warned the doctors that I might suffer from withdrawal symptoms, as I was addicted to the Beeb.

This probably explains some of the funny looks I kept getting from the nurses. And it didn't help when A visited.

"Here's a couple of things for you, may help you a bit, avoid you going 'cold turkey'," and she handed over a pocket calculator and a magazine on computers which had nothing to do with Beebs.

"They'll keep you from missing your thing," she explained and with these alarming words (remember I was still groggy) she announced that she was off to an emergency bell ringing practice.

"Ask not for whom the bell tolls", she said cheerily, by way of parting, "it might be tolling for you, yet".

After she'd gone I had a nightmare about A lending Beeb to my horrible nephew Nigel, he of the inquisitive mind and ever-ready screwdriver.

Remember what he did to his grandad's wheelchair that time? He was never the same man.

It was a relief when I woke up in my hospital bed, though I was in a cold sweat, which one of the nurses misinterpreted, so I was kept in for an extra day.

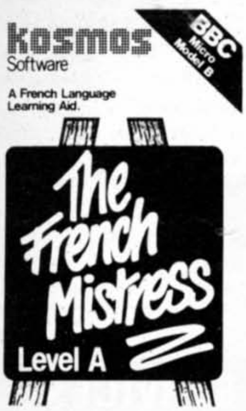
Anyway, I'm out now and I've got some time off work, which I intend to devote to my Beeb, though it's hard typing with one hand.

See you soon

Cheers, Bob.

P.S. Don't tell Andrea, but the nurses heard her talking about bell-ringing and promptly christened her Death Nell. I must send them a box of chocolates.

Learning a Language?



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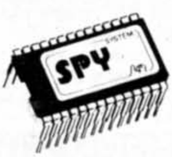

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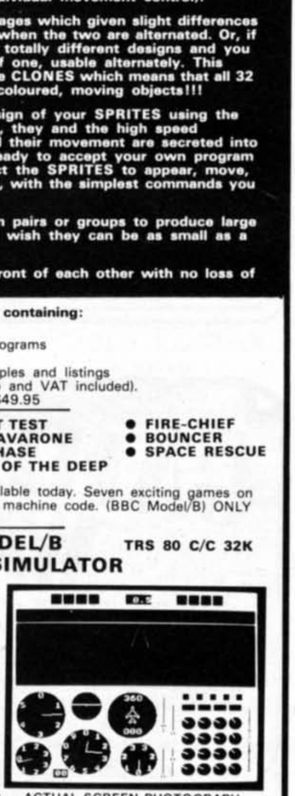

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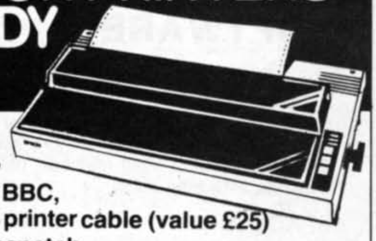

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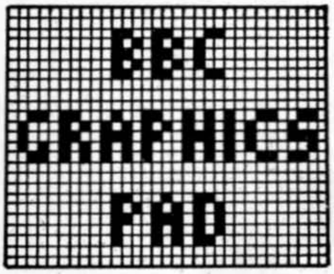

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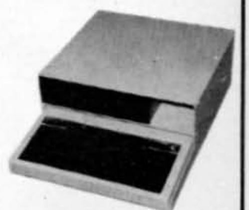

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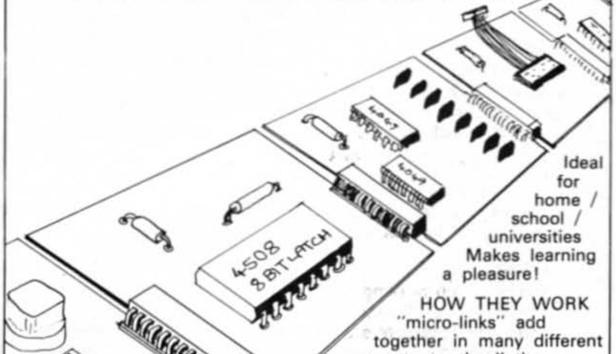

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Venturing into the underground domain of interlocking passages Felix must protect the Magical Fruit (and himself) from marauding Fruit Monsters until their life-force runs out. By eating the fruit these remorseless creatures change into more aggressive mutations. Sleep-inducing Ether capsules aid Felix in his quest, and as a last ditch attempt he can trigger the magnetic pad to instantly teleport the creatures back to their cave.

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electron user

Vol. 1 No. 1 October 1983

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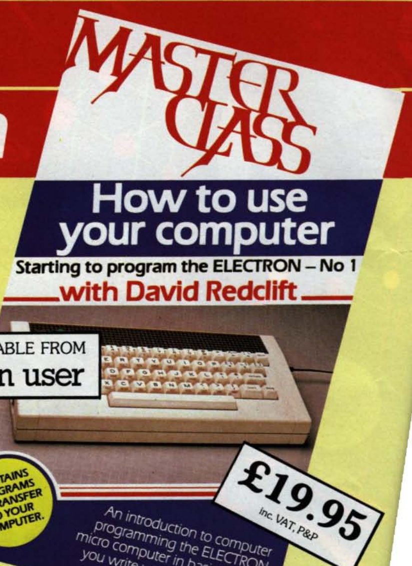
acorn electron

The easy way to learn how to program your Electron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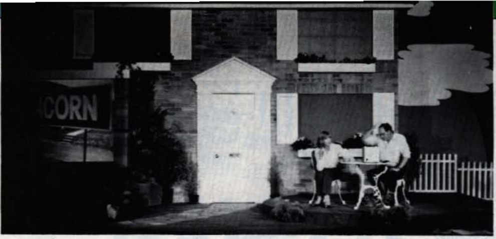

Well and truly launched

AFTER months of speculation, the Electron has been finally launched with all the glitter of a show business first night.

Members of the computer press were ushered into the ballroom of the plush Park Lane Hotel to be greeted by a theatre set that would have done the Old Vic proud.

At the far end of the room was a large, "typical" detached house, from the front door of which stepped TV personality Cliff Michelmore.

His welcome to the press was par for the course. He implied that we were witnessing an important, if not historic event: the launch of a microcomputer that truly ushered in the era of the home computing.

We then settled back to watch a film (projected onto a convenient garage door) that extolled the power and virtues of the micro-chip in increasingly exaggerated terms.

All this provoked an outburst from the audience. Several of the journalists turned to see who had beaten them to the punch.

From the outer darkness appeared Wendy Craig, playing the role of a poor little housewife, baffled by all this, sceptical of the use of microcomputers in the home and not wanting to be blinded by science ...

From then on Cliff and Wendy treated the audience to a catalogue of microcomputer cliches and truisms. The gimmicks included Wendy talking to the Electron (which of course answered back) and a sequence in which she had a dialogue with a screen "twin" whose Electron had enhanced her life beyond measure.

Behind the drama of the launch, there was a very serious intent. Said Chris Curry, managing director of Acorn: "We believe the home computer has at last grown up. With the Electron, the micro is no longer just a clever toy for bright children.

"It is an all-purpose intelligent tool – a tool that can educate, entertain, help run the home and be a window on a vast expanse of electronic information".

Acorn see the Electron becoming a familiar part of home life. The believe that it will bring microcomputing to people as yet untouched by the computer revolution – particularly women.

Continued Chris: "At Acorn we also see our approach to home computing as a first step towards combating a major problem of computing today – the non-involvement of women.

"A recent survey spelled out the dangers. Girls are 13 times less likely than boys to use a micro at home, and only 4 per cent of micro users are mothers.

"We hope that the combination of the Electron's educational pedigree and its potential application in so many areas relevant to women will help to reverse this trend".

Only time will tell if the Electron will achieve this goal. What is certain is that with this exceptional machine. Acorn are off to a flying start.

electron user

Electron User welcomes program listings and articles for publication. Listings should be accompanied by cassette tape or disc. Send to:

Electron User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

Electron User is an independent publication. Acorn Computers Ltd are not responsible for any of the articles in this issue, or for any of the opinions expressed.

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ALL the program listings printed in Electron User are also suitable for keying into the BBC Micro. Any exceptions will be indicated by the sign on the left, together with any changes in the listings that might be necessary.

Whether you're one of the proud few who own an Electron, or one of the many waiting to collect one . . .

Welcome to Electron User!

THIS is the first issue of a new magazine devoted entirely to the world of Acorn's latest computer – the Electron.

Month by month we'll be showing you how to make the most of your Electron. Its many special features place it far ahead of the competition, and we'll explain how to use them to full advantage.

As you can see already, we'll have plenty of listings for you to enter – games, graphics, educational and domestic programs. We'll cover the lot.

We will be using our first-rate team of writers to ensure that, beginner or expert, you'll find articles that you really understand.

The important thing is that Electron User is written by Electron users for Electron users. We're very keen to hear how you think the magazine should be going – and we'll act on any good ideas put forward.

And, of course, we're more than willing to consider your latest "Electronic" explorations for publication.

At the moment we're coming to you courtesy of our big brother, The Micro User. From December onwards we'll be a big magazine in our own right.

Now that's a Christmas present that no Electron user can be without!

IT'S ALL A PLOT

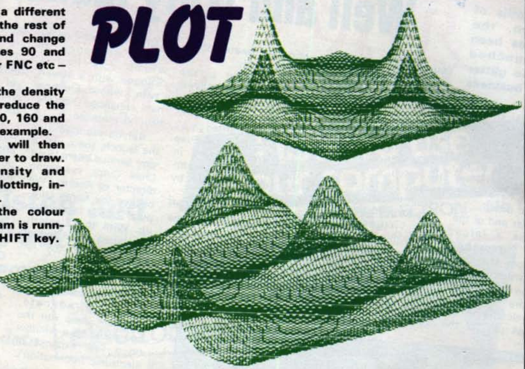
HERE'S a short program to draw three-dimensional shapes on your Electron. You only need to type up to line 260 to make the program work.

If you want a different shape, type in the rest of the program and change the FNA in lines 90 and 200 to FNB – or FNC etc – up to FNH.

To increase the density of the picture, reduce the step lines 50, 70, 160 and 190 to 0.1, for example.

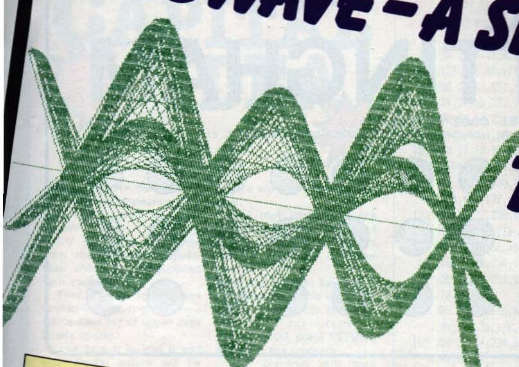
Note that it will then take much longer to draw. To reduce density and speed up the plotting, increase the step.

To change the colour while the program is running press the SHIFT key.



```
 10 REM 3D-PLOT
 20 REM (C)ELECTRON USER
 30 MODE 0
 40 X=0
    :Y=0
 50 VDU 29,0;400;
 60 FOR Y=0 TO 8 STEP .5
 70 A=69
 80 FOR X=0 TO 8 STEP .5
 90 GCOL 0,7
100 PLOT A,80*(Y+X),(Y-X+2+
    FNA(0))*30
110 A=5
120 IF INKEY (-1)
    THEN VDU 19,7,RND(7);0;
130 NEXT X
140 GCOL 0,7
150 DRAW 80*(Y+8),(Y-X+4)*30
160 NEXT Y
170 FOR X=0 TO 8 STEP .5
180 PLOT 69,80*X,-6*X+12
190 GCOL 0,0
200 FOR Y=0 TO 8 STEP .5
210 PLOT 5,80*(Y+X),(Y-X+2+
    FNA(0))*30
220 IF INKEY (-1)
    THEN VDU 19,7,RND(7);0;
230 GCOL 0,7
240 NEXT
    :NEXT
250 END
260 DEF FNA(A)
270 =1/(COS (X*2)*TAN (X*2)*
    COS (Y/2)+1.1)
280 DEF FNB(A)
290 =1/(COS (X/2)*COS (Y/2)+1
    .1)
300 DEF FNC(A)
310 =1/(COS (X)*COS (X)*
    COS (Y)+1.1)
320 DEF FND(A)
330 =(X*COS (Y)/2)*(Y*
    SIN (X)/2)
340 DEF FNE(A)
350 =1.5/(COS (X)*SIN (Y/2)+1
    .1)
360 DEF FNF(B)
370 =1/(COS (X)*SIN (Y)+1.1)
380 DEF FNG(C)
390 =1/(COS (X)*SIN (X/2)*
    COS (Y)+1.1)
400 DEF FNH(C)
410 =1/(COS (X)*SIN (X)*
    COS (Y)+1.1)
```

WEBWAVE – A SINE OF THE TIMES?



THIS listing uses your Electron's superb graphics facilities to picture three interacting sine waves in different colours.

If you don't know what a sine wave is, don't worry, just admire the art work!

```
10 REM WEB-WAVE
20 REM (C)ELECTRON USER
30 MODE 6
  :PRINT "I'm doing some calculatin
  g..."
40 DIM C(255)
  :FOR I%=0 TO 255
  :C(I%)=COS (I%/20)
  :NEXT
50 DEF FNcos(A%,B%)=C(A%/5)*B%
60 MODE 1
  :VDU 23;8202;0;0;0;
70 DRAW 0,1023
80 DRAW 1279,1023
90 DRAW 1279,0
100 DRAW 0,0
110 VDU 29,0;511;
120 MOVE 0,0
  :DRAW 1279,0
130 PROCCurve(1,500)
140 PROCCurve(2,-350)
150 PROCCurve(3,200)
160 REPEAT UNTIL FALSE
170 DEF PROCCurve(COL%,HEIGHT%)
  C%=30
  :GCOL 0,COL%
180 REPEAT MOVE 0,HEIGHT%
190 FOR X%=0 TO 1279 STEP C%
200 DRAW X%,FNcos(X%,HEIGHT%)
210 NEXT
220 C%=C%+5
230 UNTIL C%>325
240 ENDPROC
```

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I'VE ALSO GOT VERY SORE FINGERS!

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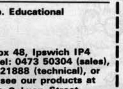

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Modem Interface Vic 20/Dragon £24.95 + £1.14 p&p + £3.91 VAT	£30.00		
Light Pen (BBC 'B' or Spectrum) £12.95 + 62p p&p + £2.03 VAT	£15.60		
Graphics Digitizer (BBC 'B' only) £29.95 + £1.35 p&p + £4.70 VAT	£36.00		

B'card/Access No. or cheque enclosed for £

TMU10

A CAPITAL IDEA

ARE you tired of the same old boring letters appearing time and time again on your screen?

Do you want a change from the run-of-mill upper-case character set supplied with your Electron?

Then this program was written for you. It gives you a whole new set of upper case letters to use.

Just type it in, run it and your capital letters will be transformed.

One word of warning however:

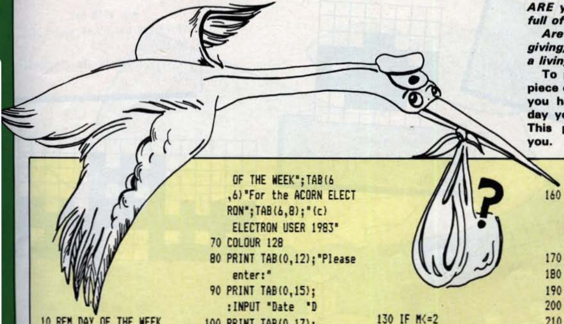
You may notice that line 30 changes the value of PAGE. This is to make room for the expanded character set.

If you want to load other programs after this using the normal, boring old character set then just type in PAGE=&E00, press RETURN and load the program.

The Electron will then return to its normal self.

```
10 REM CAPITAL IDEA
20 REM (C) ELECTRON USER
30 *FX20,5
40 PAGE =PAGE +&500
50 VDU 23,65,56,68,68
   ,68,124,68,238,0
60 VDU 23,66,240,72,72
   ,124,66,66,252,0
70 VDU 23,67,124,68,128
   ,128,128,68,124,0
80 VDU 23,68,252,18,34
   ,34,34,66,252,0
90 VDU 23,69,254,64,64
   ,240,64,64,254,0
100 VDU 23,70,254,64,64
   ,240,64,64,64,0
110 VDU 23,71,120,68,64
   ,128,142,132,124,0
120 VDU 23,72,238,68,68
   ,68,124,68,238,0
130 VDU 23,73,56,16,16
   ,16,16,84,124,0
140 VDU 23,74,254,8,8,72
   ,72,72,48,0
150 VDU 23,75,228,68,88
   ,96,120,76,196,0
160 VDU 23,76,224,64,64
   ,66,66,70,252,0
170 VDU 23,77,40,108,84
   ,84,84,84,214,0
180 VDU 23,78,198,100,84
   ,84,84,76,198,0
190 VDU 23,79,60,36,66
   ,66,66,36,60,0
200 VDU 23,80,252,66,66
   ,252,64,64,224,0
210 VDU 23,81,60,66,66
   ,82,74,68,58,0
220 VDU 23,82,252,66,66
   ,240,80,88,198,0
230 VDU 23,83,124,130,128
   ,120,4,132,120,0
240 VDU 23,84,126,82,16
   ,16,16,20,60,0
250 VDU 23,85,238,68,68
   ,68,68,68,56,0
260 VDU 23,86,238,68,68
   ,108,40,40,16,0
270 VDU 23,87,198,84,84
   ,84,84,108,40,0
280 VDU 23,88,198,100,28
   ,48,104,76,198,0
290 VDU 23,89,238,68,68
   ,68,56,16,124,0
300 VDU 23,90,252,132,140
   ,48,66,66,126,0
```

What day were you born?



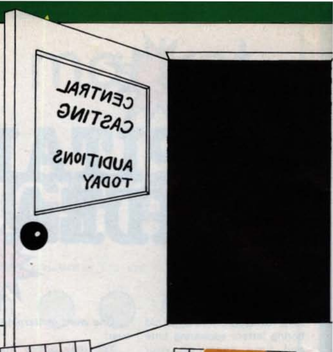
ARE you fair of face or full of grace?

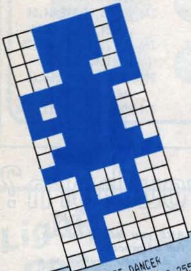
Are you loving and giving, working hard for a living?

To posses this initial piece of self-knowledge you have to know the day you were born on. This program will tell you.

```
10 REM DAY OF THE WEEK
20 REM (C)ELECTRON USER
30 MODE 1
40 VDU 19,7,15;0;
50 COLOUR 129
   :COLOUR 2
60 PRINT TAB(9,4);"DAY
    OF THE WEEK";TAB(6
   ,6)"For the ACORN ELECT
   RON";TAB(6,8);"(c)
    ELECTRON USER 1983"
70 COLOUR 128
80 PRINT TAB(0,12);"Please
    enter:"
90 PRINT TAB(0,15);
   :INPUT "Date  "D
100 PRINT TAB(0,17);
   :INPUT "Month "M
110 PRINT TAB(0,19);
   :INPUT "Year  "Y
120 IF M=0 AND D=0
   AND Y=0
   THEN END
130 IF M<=2
   THEN M=M+12
   :Y=Y-1
140 N=D+2*M+INT (.6*(M+1))+
   Y+INT (Y/4)-INT (Y/100)
   +INT (Y/400)+2
150 N=INT ((N/7-INT (N/7))*
   7+.5)
160 PRINT '''"The day is
    ";
   :COLOUR 7
   :PRINT ;DAY$(N)
170 G=GET
180 UNTIL 0
190 DEF PROCinit
200 DIM DAY$(6)
210 FOR N=0 TO 6
220 READ DAY$(N)
230 NEXT N
240 ENDPROC
250 DATA Saturday,Sunday
   ,Monday,Tuesday,Wednesd
   ay,Thursday,Friday
```

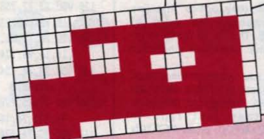
Casting Agency





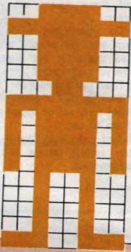
BALLET DANCER

```
VDU23.224.61.61.61.25.255.188.
252.60
VDU23:225.126.255.36.36.60.32.
32.32
```



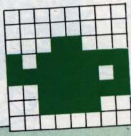
AMBULANCE

```
VDU23,233,0,15,9,9,127,127,127,48
VDU23,234,0,254,222,142,222,254,254,12
```



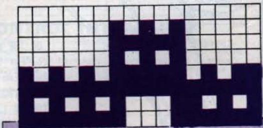
MAN WITH HAT

```
VDU23.228.60.255.60.60.60.24.2
55.189
VDU23.229.189.189.189,36.36.36
.36.231
```



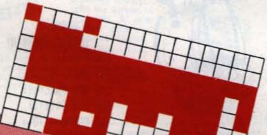
TEAPOT

```
VDU23,230,0.0.24.191,253.63.60
.0
```



CASTLE

```
VDU23.231.0.2.3.2.171.255.170.254
VDU23.232.0.160.224.160.235.255.53.63
```



COW

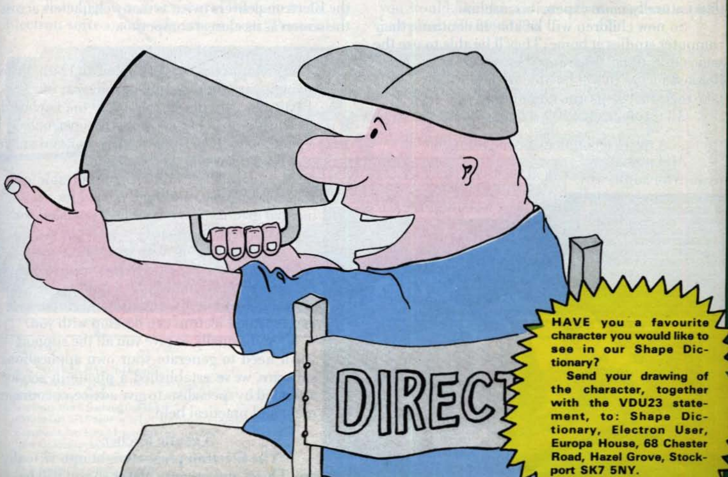
```
VDU23,226,136,112,127,127,127,14,10,30
VDU23.227,0,0,255,253,253,220,20,60
```

THIS is the start of the unique *Electron User* Shape Dictionary – an essential source of off-the-shelf user-defined characters which you can incorporate into your own programs.

Over the next few months it will build up into a comprehensive collection that no Electron programmer will want to be without.

Bring these handy characters to life in your own Electron programs with these ready-to-go listings. And there'll be more next month!

```
10 MODE 2
20 VDU 23:8202;0;0;0:
30 PROCDEFINE
40 CLS
   :COLOUR 14
   :PROCBALLET(9.15)
50 PROCPAUSE
60 CLS
   :COLOUR 3
   :PROCCOW(9.15)
70 PROCPAUSE
80 CLS
   :COLOUR 7
   :PROCMAN(9.15)
90 PROCPAUSE
100 CLS
   :COLOUR 2
   :PROCTEAPOT(9.15)
110 PROCPAUSE
120 CLS
   :COLOUR 1
   :PROCCASTLE(9.15)
130 PROCPAUSE
140 CLS
   :COLOUR 5
   :PROCAMBULANCE(9.15)
150 PROCPAUSE
160 GOTO 40
170
180 DEF PROCDEFINE
190 VDU 23.224.61.61.61
   .25,255.188,252,60
200 VDU 23,225.126,255.36
   .36,60.32,32.32
210 VDU 23.226,136.112,127
   .127.127.14,10.30
220 VDU 23,227.0.0,255.253
   .253.220,20.60
230 VDU 23.228,60,255.60
   .60.60,24,255.189
240 VDU 23,229.189.189.189
   .36,36.36.36,231
250 VDU 23,230,0,0,24.191
   .253.63.60.0
260 VDU 23,231,0.2,3.2.171
   .255,170,254
270 VDU 23.232,0.160.224
   .160,235.255.53.63
280 VDU 23,233.0,15,9.9
   .127.127.127.48
290 VDU 23,234.0,254.222
   ,142.222.254,254,12
300 ENDPROC
310
320 DEF PROCBALLET(X%.Y%)
330 VDU 31.X%.Y%.224.31
   .X%.Y%+1.225
340 ENDPROC
350
360 DEF PROCCOW(X%.Y%)
370 VDU 31.X%.Y%.226.31
   .X%+1,Y%,227
380 ENDPROC
390
400 DEF PROCMAN(X%.Y%)
410 VDU 31,X%.Y%.228.31
   .X%,Y%+1.229
420 ENDPROC
430
440 DEF PROCTEAPOT(X%.Y%)
450 VDU 31.X%.Y%.230
460 ENDPROC
470
480 DEF PROCCASTLE(X%.Y%)
490 VDU 31.X%.Y%.231.31
   .X%+1.Y%.232
500 ENDPROC
510
520 DEF PROCAMBULANCE(X%
   .Y%)
530 VDU 31.X%.Y%.233,31
   ,X%+1,Y%,234
540 ENDPROC
550
560 DEF PROCPAUSE
570 A$=INKEY$ (500)
580 ENDPROC
```



HAVE you a favourite character you would like to see in our Shape Dictionary?

Send your drawing of the character, together with the VDU23 statement, to: Shape Dictionary, Electron User, Europa House, 68 Chester Road, Hazel Grove, Stockport SK7 5NY.

The new Electron from Acorn. Ask any child at school why it's worth £199.

Most British children have one thing in common with the new Electron microcomputer: they speak the same language.

You see, the Electron is the first micro remotely in this price range to use BBC Basic, the computer language that is rapidly becoming the standard in British schools.

>I use BBC Basic.
The leading computer language in schools.

But that's not all. Most children will feel at home with the Electron as soon as they lay hands on it.

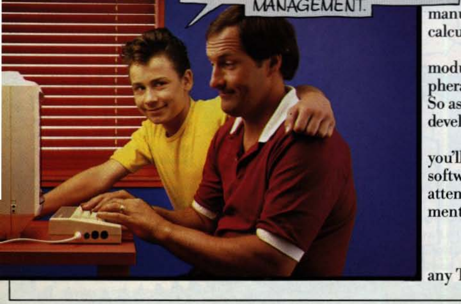
This is because it has developed out of the Micro that has been chosen by over 80% of schools participating in the Government's current Micros In Schools project. It has a similar keyboard and has most of the functions of this much acclaimed (but naturally, more expensive) machine.

So now children will be able to continue their computer studies at home. They'll be able to use the same educational programs they use at school. And, if asked nicely, they'll be able to help willing adults take their first steps into computing.

All this for only £199.

A micro technology break-through.

And now a few reasons for adults why the Electron is such an exceptional machine at the price.


NOW YOU'VE MASTERED MONSTERS, WE COULD MOVE ON TO MONEY MANAGEMENT.

The Electron is neat and compact. Yet it is fast and powerful. (Full details, for the technically minded, are in the box opposite.)

It produces high quality sound using its own internal speaker.

And it offers a range of facilities many larger more expensive machines just cannot match.

For example the Electron's colour graphics have the highest resolution of any home computer.

This is because the chip that controls the graphics, specially designed by Acorn, is one of the most advanced of its kind. As a result, the Electron delivers twice as many characters across the screen as its closest competitor.

Built to last and to grow.

The Electron has been designed and built to be a permanent part of the family, year in year out.

Particular care has been paid to the keyboard. It is electric typewriter style: robustly constructed with a good, solid 'feel.' It has a space bar, and single entry keys for key commands.

In other words it's comfortable and easy to use, avoiding the need for the manual gymnastics sometimes associated with calculator style keyboards.

And it will grow with you via expansion modules, that Acorn are developing, to take peripheral additions such as printers and disc drives. So as your knowledge, interest and ambitions develop, the Electron can develop with you.

Additionally, to give you all the support you'll need to generate your own applications software, we've established a phone-in service attended by specialists to give advice, encouragement and practical help.

A gentle teacher.

The Electron plugs straight into virtually any TV set and cassette player so you will be ready to go as soon as you get it home.

It comes not only with a comprehensive user guide, which describes the machine and its functions, but also with a book that takes you step by step through the basic principles of programming.

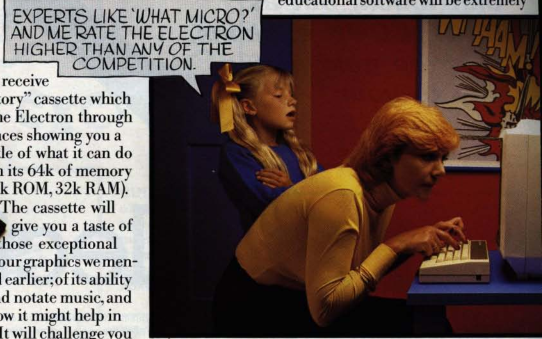
A free taste of its versatility.

You will also receive an "Introductory" cassette which will put the Electron through its paces showing you a little of what it can do with its 64k of memory (32k ROM, 32k RAM). The cassette will give you a taste of those exceptional colour graphics we mentioned earlier; of its ability to play and notate music, and show you how it might help in home accounting. It will challenge you to a few games and will, if you ask it, do your whole family's biorhythms in a matter of seconds.

You will in short, through the 15 separate programs it contains, get a glimpse of the Electron's potential. But only a glimpse, for that potential is as limitless as your own interest and imagination.

A widening range of software.

To help you realise some of that potential, Electron software already ranges from "Personal Money Management" through "Starship Command" to "Creative Graphics" (which, incidentally, includes some spectacular three-dimensional rotating shapes). Naturally, with its strong educational links, educational software will be extremely


EXPERTS LIKE 'WHAT MICRO?' AND ME RATE THE ELECTRON HIGHER THAN ANY OF THE COMPETITION.

important for the Electron and even now O and A Level revision papers are being processed for Electron users.

How to get your Electron.

The Electron is available from selected W H Smith and local Acorn stockists. However, if you would like to order one with your credit card, or if you would like the address of your nearest supplier, just phone 01-200 0200.

acorn electron

Technical Specifications

Hardware.
2MHz 6502.
32K ROM 32K RAM (64K total).
High resolution graphics 640 x 256 max.
Seven display modes.
8 colours and 8 flashing colours.
1200 baud CUTS tape interface with motor control.
Expansion bus for add-on interface modules.
Internal loudspeaker.
PAL UHF output to colour or black and white domestic TV.
RGB output for colour monitor.
56 key full travel QWERTY keyboard with spacebar.

Software.
BBC BASIC.
Extensions include interger, floating point and string variables. multi dimensional arrays: IF... THEN... ELSE. REPEAT... UNTIL, procedures with local variables.
Operating system allows plot, draw and fill commands.
Event timing.
Built-in assembler.
6502 assembly language can be mixed with BASIC.

The Acorn Electron.

It doesn't look all that much, but as MIKE COOK explains, it is the gold-plated key to your

EXPANDING electron

HIDING at the back of the Electron, covered by a slip-on plastic protector, is a double sided, gold plated, 50-way edge connector.

No mention of this in the Electron's User Guide, but it is the key to expanding the Electron to include the type of goodies that have made the BBC Micro so popular.

Using this edge connector you can link up circuits that add a printer port, analogue, digital and serial ports, sideways ROMs and disc interface, as well as all the bolt-on goodies that will be developed in the future for the Electron or the BBC Micro.

The table shows the signals that come out of the edge connector.

These are for issue 1 boards, but should stay the same for all issues.

The key shown in place of contact 15 is a slot that prevents the edge connector being placed on the wrong way round.

When the microprocessor wants to access a memory location, it sets the R/W line to a logic one (if it is going to read it) or a logic zero (if it is going to write to it).

The address of the memory location to be used is placed on the 16 lines of the address bus.

These are labelled A0 to A15 and will contain a combination of logic ones and zeroes corresponding to the address required.

This gives a maximum of 65,536 different combinations or addresses and is the maximum amount of memory that the microprocessor can directly access.

In computer terms this is known as 64k, because 1k is a "baker's dozen" thousand – that is, 1024.

When a memory device detects an address on the address bus which corresponds to it, the memory device places the contents of that memory on the data bus.

This is a set of eight wires labelled D0 to D7 but, unlike the address bus, it is bi-directional.

This means it can be an input or an output depending upon whether the microprocessor is reading or writing to a memory location.

There are two signals that can make the microprocessor break off from the program it is executing and, in effect, call a subroutine.

These are known as interrupts, and the two are the NMI (none maskable interrupt) and the IRQ (interrupt request).

In order to synchronise the transfer of data from memory, three clock signals are available.

These are the 16 mHz clock, the 1 mHz clock and the microprocessor's ϕ_0 clock.

The other connections are for the power. One set is for power into the Electron so that a bolt-on device can have a built-in mains transformer of greater capacity than the Electron's plug adaptor.

This still allows the power regulator in the Electron to be utilised.

The regulated power from the Electron is also available on the edge connector to power the bolt-on devices.

The final connection is the audio input/output and may be used by speech synthesisers or high power amplifiers.

It should be noted that the range of address bus signals available on the Electron edge connector is greater than is available on the BBC Micro with its collection of connectors and sockets.

By careful design of add-on circuitry it will be possible to upgrade the Electron to include all the bells and whistles of its big brother.

This gold plated connector is indeed the key to the Electron's expansion.

ELECTRON EDGE CONNECTOR

Component side function	Pin No.	Wiring side function
18v AC in	1	18v AC in
18v AC return	2	18v AC return
–5v	3	–5v
0v	4	0v
+5v	5	+5v
Audio in/out	6	16 mHz clock
1 mHz clock	7	ϕ_0 microprocessor clock
Reset	8	NMI
IRQ	9	R/W
D7	10	D6
D5	11	D4
D3	12	D2
D1	13	D0
not connected	14	not connected
	KEY	
A15	16	A14
A13	17	A12
A11	18	A13
A10	19	A0
A1	20	A2
A3	21	A4
A5	22	A6
A7	23	A8
0v	24	0v
+5v	25	+5v

SOUNDS.. EXCITING

BUILD up a library of exciting sounds to enhance your own programs with these listings. And watch out for more next month!

WAILING BUGS

```
ENVELOPE 4,4,-1,1,0,20,20,0,126,0,0,-126,126,126
SOUND1,4,200,100
```

POLICE SIREN

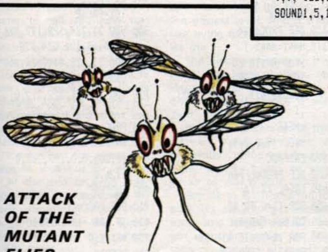
```
ENVELOPE 1,1,-7,7,0,10,10,0,126,0,0,-126,
126,126
SOUND 1,1,136,50
```

CRAZY MACHINERY

```
ENVELOPE 5,1,70,6,0,31,10,0,126,
0,0,-126,126,126
SOUND1,5,100,200
```

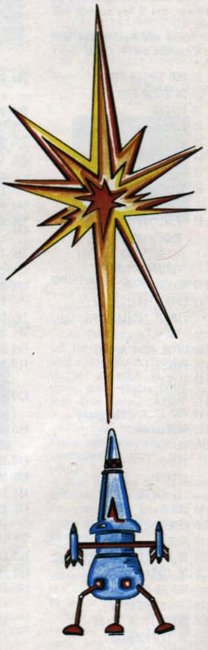
UP, UP AND AWAY

```
ENVELOPE 2,1,1,0,0,200,0,0,126,
0,0,-126,126,126
SOUND1,2,0,40
```



ATTACK OF THE MUTANT FLIES

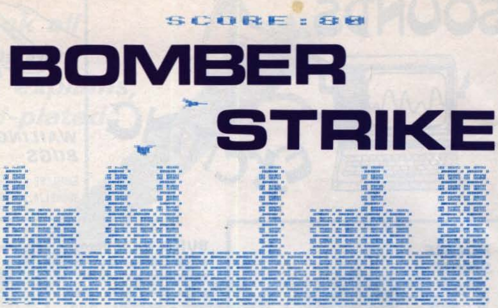
```
ENVELOPE 6,1,36,-36,0,20,20,0,126,0,0,-126,126,126
SOUND1,6,160,100
```



SCORE A HIT

```
ENVELOPE 3,4,90,-15,-15,10,20.20,1
26,0,0,-126,126,126
SOUND1,3,100,20
```

BOMBER STRIKE



YOU are the bomb-aimer of a B17 flying over an enemy city.

Your mission is to drop bombs on the buildings below and obliterate them completely.

The trouble is, it takes more than one bomb run over the target to achieve this and on each successive run you get lower. Get too low and you crash!

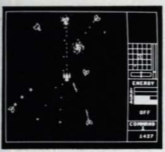
It's up to you. Destroy the city before you become an involuntary kamikazee pilot.

The A key will make you go slower, the S key speeds you up.

Press the Return key and it's bombs away. Good luck!

```
 10 REM BOMBER STRIKE
 20 ON ERROR PROCerr
 30 REPEAT
 40 MODE 6
 50 *FX12,0
 60 *FX15,1
 70 VDU 19,7,3;0;
 80 PRINT TAB(12,12)"BOMBER
     STRIKE"
 90 PRINT TAB(12,14);"A =
     SLOW";TAB(12,16);"S
     = FAST";TAB(12,18);
    "RETURN = BOMB"
100 REPEAT
110 PRINT TAB(12,20);
    :INPUT "SKILL LEVEL 1/6
     "S%
120 UNTIL S%>0 AND S%<7
130 PROCinit
140 REPEAT
150 MODE 2
160 VDU 23,0,8202;0;0;0;
170 PROCscreen
180 V%=-64
    :X%=0
    :Y%=991
    :Z%=FALSE
190 VDU 5
200 REPEAT
210 PROCfly
220 IF FNP(V%,W%)<>0 Z%=TRUE
230 IF INKEY (-74) AND
    NOT G% PROCdrop
240 IF G% PROCbomb
250 UNTIL Z% OR Y%<64
260 IF Z% PROCdead
270 UNTIL MAN%=0
280 VDU 4
    :PRINT TAB(0,5);"FINAL
     SCORE:";SC%'"ANOTHER
     GAME Y/N"
    :VDU 5
290 REPEAT G=GET
    :UNTIL G=78 OR G=89
300 IF G=78 PROCend
310 UNTIL FALSE
320 DEF PROCfly
330 X%=X%+C%
    :IF X%>1216 Y%=Y%-32
    :X%=0
340 PROCplane(X%,Y%)
350 K%=INKEY (0)
    :IF K%=-1 ENDPROC
360 IF K%=65 C%=C%-1
    :IF C%<=10 C%=10
370 IF K%=83 C%=C%+1
    :IF C%>=64 C%=64
380 ENDPROC
390 DEF PROCplane(X%,Y%)
400 GCOL 3,2
410 MOVE X%,Y%
    :VDU 224
420 MOVE V%,W%
    :VDU 224
430 V%=X%
    :W%=Y%
440 ENDPROC
450 DEF PROCdrop
460 SOUND &11,1,200,60
470 A%=X%
    :B%=Y%-64
    :G%=TRUE
480 ENDPROC
490 DEF PROCbomb
500 B%=B%-32
    :IF FNP(A%,B%)<>0
    SOUND &11,0,0,0
    :SOUND &10,-15,4,3
    :MOVE D%,E%
    :VDU 225
    :G%=FALSE
    :PROChole
    :D%=-64
    :ENDPROC
510 IF B%<32 SOUND &11,0
    ,0,0
    :MOVE D%,E%
    :VDU 225
    :G%=FALSE
    :D%=-64
    :ENDPROC
520 MOVE A%,B%
    :VDU 225
530 MOVE D%,E%
    :VDU 225
540 D%=A%
    :E%=B%
550 ENDPROC
560 DEF PROChole
570 MOVE A%,B%
    :VDU 9,9,127,127,127
    ,127,9,9,9,9,10,127
    ,127,127,127
580 VDU 4
    :SC%=SC%+20
    :PRINT TAB(11,0);SC%
    :VDU 5
590 ENDPROC
600 DEF PROCdead
610 MAN%=MAN%-1
    :FOR N=1TO 60
    :VDU 19,0,RND(7);0;
    :SOUND &11,-15,RND(255)
    ,1
    :NEXT
    :VDU 19,0,0;0;
620 ENDPROC
630 DEF PROCscreen
640 LOCAL X%,Y%
650 FOR X%=0 TO 18
660 COLOUR RND(4)
670 FOR Y%=31 TO 31-(S%*
    RND(3)) STEP -1
680 PRINT TAB(X%,Y%);
    :VDU 226;
690 NEXT ,
700 PRINT TAB(5,0);"SCORE:"
710 ENDPROC
720 DEF FNP(X%,Y%)
730 =POINT(X%+32,Y%)
740 DEF PROCend
750 *FX12,0
760 CLS
770 END
780 DEF PROCinit
790 *FX12,1
800 *FX11,1
810 A%=0
    :B%=0
    :X%=0
    :Y%=991
820 MAN%=3
    :SC%=0
830 C%=32
    :D%=0
    :E%=0
    :V%=-64
    :W%=1023
840 Z%=FALSE
    :G%=FALSE
850 VDU 23,224,128,192,224
    ,120,63,120,224,128
860 VDU 23,225,231,126,60
    ,60,60,60,24,24
870 VDU 23,226,222,222,0
    ,125,125,0,222,222
880 PROCplane(X%,Y%)
890 ENVELOPE 1,128,-1,0
    ,0,200,0,0,127,0,0,0
    ,126,0
900 ENDPROC
910 DEF PROCerr
920 IF ERR =17 ENDPROC
930 *FX12.0
940 REPORT
    :PRINT "IN LINE "ERL
950 VDU 22,7
960 END
```

SOFTWARE SURGERY



Starship Command

(Acornsoft)

SPACE is getting awfully nasty nowadays. It seems to be full of aliens all bent on destroying anyone in their path.

In Starship Command you're in charge of a battle starship with the task of ridding space of these hostile elements.

The only weapons you possess are your torpedoes and your skill. The skill consists of being able to manoeuvre your ship into a position where you can zap the other ships which are coming at you thick and fast.

You've got both short and long range scanners which show the enemies' positions as they approach. The position of your ship and the closer attackers is shown on the main screen.

Your ship stays still in the middle of the display, the other ships appearing to move round it as you turn left and right in order to fire at them.

You've also got a rotation meter to tell you how fast you're turning and an indicator of the state of your energy banks.

Should these banks fall to zero your defensive shields collapse and the aliens will destroy you. I did warn you that it's getting nasty out there.

It's not just the aliens you have to look out for, either.

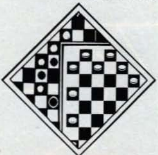
At the end of every mission you are assessed by your superiors. And their judgement can be worse than anything the aliens might hand out.

Even if you do well, all you are rewarded with are other, harder missions.

I can't say that it's easy, but all the information you need is there before you on the various scanner displays.

The game seems to have everything. The graphics are superb, the instructions thorough and, once you get used to the way your ship stays still while the aliens move, the whole thing is enthralling.

Peter Gray



Draughts & Reversi

(Acornsoft)

YOU get two games for the price of one in this package.

The first is Draughts, where you play the Electron at the age-old game or, if you're like me, the Electron plays with you!

You have the choice of eight different levels of play and I can't beat the beast at the easiest level. And it's no use trying to cheat – it won't let me.

The Electron knows all the rules and won't allow an illegal move. In fact, if you give it half a chance it will 'huff' you!

It's a lovely version of the game. You play on a tastefully coloured board, using the keyboard or joysticks to make your move.

Simple to learn and fun to play, it's easy to get carried away and forget that you've got another game on the tape ... and the other game is even better.

Reversi is an old logic game played on an eight by eight grid of squares between two opponents. Once again, it's you playing the Electron.

The aim is to trap its pieces between two of yours and so turn them into your colour. The winner is the one with the most pieces when no more moves can be made.

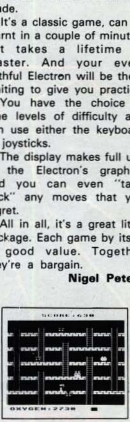
It's a classic game, can be learnt in a couple of minutes, but takes a lifetime to master. And your ever-faithful Electron will be there waiting to give you practice.

You have the choice of nine levels of difficulty and can use either the keyboard or joysticks.

The display makes full use of the Electron's graphics and you can even "take back" any moves that you regret.

All in all, it's a great little package. Each game by itself is good value. Together they're a bargain.

Nigel Peters



Monsters

(Acornsoft)

IN Monsters the screen becomes a pattern of walls and ladders, along which you, in the guise of a little animated man, are chased by a series of colourful monsters.

You've only got three lives and every time they catch you, you lose a life.

To make things more difficult, while you're dashing along the tops of the walls and running up and down the ladders your oxygen supply is running out.

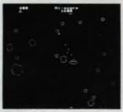
You have to destroy the monsters before that happens, and the only way to do this is to dig a hole in a wall, lure the monsters into it and fill it in quickly before they can climb out.

However, as soon as you get rid of one set of monsters they're replaced by another lot of a different colour.

It gets faster and faster and more and more fun. The graphics are excellent and the instructions easy to follow.

It's also compulsive, making you ask for the notorious "one more go". You could say monsters grow on you.

Peter Gray



Meteors

(Acornsoft)

DRIFTING alone in space your ship is menaced by a sudden meteor storm. Collision is imminent.

All that you have to fight off the huge rocks are your ship's laser bolts. The trouble is that as soon as you hit them the meteors break up into little pieces which are just as deadily.

You have to blast away at these until they've all been destroyed or they'll destroy you!

Just to make things more difficult, all the firing has attracted the attention of some extremely hostile flying saucers.

These take the opportunity to snipe at you while you're distracted by the meteors, so you've got to shoot at them as well.

You do have thrusters to help you dodge, and if it all gets too much you can escape into hyperspace.

It's great fun, a game of quick thinking and fast reactions. Colourful and fast, space flight will never seem the same again.

Nigel Peters

SENTINEL
X7

ARCADE ACTION FOR THE BBC MICRO 32K

SENTINEL

In a far quadrant of space are the single dimension gateways to the anti-matter world of Migon.

You must stop the constant bombardment of anti matter plasm bolts and meteors in sectors 1 and 2 and the probe vessel in sector 3.

It will be a constant race as the network of laser walls dissolve and they escape into free space. **6·95**

CENTIPEDE

You are caught in a vicious jungle of giant insects. Centipedes are attacking you from all sides. Killer fleas are dropping from the sky, and to top things off there's a venemous spider lurking in the background. You only have your trusty laser cannon as defense.

6·95

INVADERS

A superb example of this truly classic arcade game. Includes all the features of the original and much, much more.

6·95

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